UNIVERSITY OF TORONTO
3 1761 01184495 8

Putnam's Science Series

1.	**The Study of Man.** By A. C. HADDON.	$2.00
2.	**The Groundwork of Science,** By ST. GEORGE MIVART.	$2.00
3.	**Rivers of North America.** By ISRAEL C. RUSSELL.	$2.00
4.	**Earth Sculpture; or, The Origin of Land Forms.** By JAMES GEIKIE.	$2.00
5.	**Volcanoes: Their Structure and Significance.** Revised Ed. By T. G. BONNEY.	$2.00
6.	**Bacteria.** By GEORGE NEWMAN.	$2.00
7.	**A Book of Whales.** By F. E. BEDDARD.	$2.00
8.	**Comparative Physiology of the Brain,** etc. By JACQUES LOEB.	$2.00
9.	**The Stars.** By SIMON NEWCOMB.	$2.00
10.	**The Basis of Social Relations.** By DANIEL G. BRINTON.	$2.00
11.	**Experiments on Animals.** By STEPHEN PAGET.	$2.00
12.	**Infection and Immunity.** By GEORGE M. STERNBERG.	$2.00
13.	**Fatigue.** By A. MOSSO.	$1.50
14.	**Earthquakes.** By CLARENCE E. DUTTON.	$2.00
15.	**The Nature of Man.** By ÉLIE METCHNIKOFF.	$1.50
16.	**Nervous and Mental Hygiene in Health and Disease.** By AUGUST FOREL.	$2.00
17.	**The Prolongation of Life.** By ÉLIE METCHNIKOFF.	$1.75
18.	**The Solar System.** By CHARLES LANE POOR.	$2.00
19.	**Heredity.** By J. ARTHUR THOMPSON, M.A.	$3.50
20.	**Climate.** By ROBERT DeÇOURCY WARD.	$2.00
21.	**Age, Growth, and Death.** By CHARLES S. MINOT.	$2.50
22.	**The Interpretation of Nature.** By C. LLOYD MORGAN.	$1.25
23.	**Mosquito Life.** By EVELYN GROESBEECK MITCHELL.	$2.00
24.	**Thinking, Feeling, Doing.** By E. W. SCRIPTURE.	$1.75
25.	**The World's Gold.** By L. DE LAUNAY.	$2.00
26.	**The Interpretation of Radium.** Revised Ed. By F. SODDY.	$2.00
27.	**Social Evil.** By E. R. A. SELIGMAN.	$1.75
28.	**Microbes and Toxins in Nature.** By E. BURNET.	$2.00
29.	**Problems of Life and Reproduction.** By M. HARTOG.	$2.50
30.	**Problem of the Sexes.** By J. FINOT.	$2.00
31.	**The Positive Evolution of Religion.** By F. HARRISON.	$2.00
32.	**The Science of Happiness.** By J. FINOT.	$2.00
33.	**Genetic Interpretation.** By JAMES MARK BALDWIN.	$2.00
34.	**Mosquito Control in Panama.** By J. A. LE PRINCE.	$2.50
35.	**The Organism as a Whole.** By JACQUES LOEB.	$2.50

M. ELIE METCHNIKOFF

THE
NATURE OF MAN

STUDIES IN OPTIMISTIC PHILOSOPHY

BY

ÉLIE METCHNIKOFF
PROFESSOR AT THE PASTEUR INSTITUTE

THE ENGLISH TRANSLATION
EDITED BY
P. CHALMERS MITCHELL
M.A., D.Sc. Oxon.
SECRETARY OF THE ZOOLOGICAL SOCIETY
OF LONDON

UNIVERSITY OF TORONTO LIBRARY

180244.
11.5.23.

G. P. PUTNAM'S SONS
NEW YORK AND LONDON
The Knickerbocker Press

M

COPYRIGHT, 1903
BY
G. P. PUTNAM'S SONS

Eleventh Printing

EDITOR'S INTRODUCTION

WHEN Pasteur died a remarkable article appeared in one of the Paris newspapers. The writer described the intimate routine of the life at the Pasteur Institute, and compared it with that of a mediæval religious community. A little body of men, forsaking the world and the things of the world, had gathered together under the compulsion of a great idea. They had given up the rivalries and personal interests of ordinary men, and, sharing their goods and their work, they lived in austere devotion to science, finding no sacrifice of health or money, or of what men call pleasure, too great for the common object. Rumours of war and peace, echoes of the turmoil of politics and religion, passed unheeded over their monastic seclusion; but if there came news of a strange disease in China or Peru, a scientific emissary was ready with his microscope and his tubes to serve as a missionary of the new knowledge and the new hope that Pasteur had brought to suffering humanity. The adventurous exploits and the patient vigils of this new Order have brought about a revolution in our knowledge of disease, and there seems no limit to the triumphs that will come from the parent Institute in Paris and from its many daughters in other cities.

Elie Metchnikoff, now Professor at the Pasteur Institute in Paris, is one of the most distinguished of the disciples who left all else to follow Pasteur. He was born on the third (16) May, 1845, in a village of the Government of

Kharkoff (Little Russia). He was educated at the Gymnasium and the University of Kharkoff, passing through the Faculty of Science. From 1864 to 1870 he worked at Zoology at Giessen, Göttingen and Munich, successively under three well-known zoologists, Leuckhart, Henle and Von Siebold, and was then appointed Professor of Zoology and Comparative Anatomy at Odessa. He made expeditions to Madeira, Teneriffe and the Kalmuck Steppes in connection with his zoological researches. In 1882, in consequence of administrative difficulties, arising as part of the troubles that followed the murder of the Tzar, Alexander II., he resigned the Professorship and became Director of the municipal Bacteriological Laboratory. In 1888 he went to the Pasteur Institute, and has remained there since that time.

The earlier part of Metchnikoff's career was devoted to Zoology, and chiefly to investigation of the embryological history of the lower invertebrates, and the sequence of his discoveries should afford food for reflection to those Baconian economists who are unwilling to shelter any tree of knowledge that does not give immediate promise of marketable fruit. The labour of many years spent in minute tracing of the development of insects, echinoderms, worms and jellyfish, would appear sufficiently unprofitable to those who give a scanty support to Botany as the provider of drugs, who tolerate Chemistry because it has supplied aniline dyes, and who patronise the physical sciences from a lively sense of the convenience of telephones and telegraphs. And yet from these remote, inhuman interests, Metchnikoff, without intellectual transition, passed directly to results affecting vitally the human race, and became one of the high priests of Bacteriology and a guardian of the Pandora's box of modern times.

From observations made originally on water-fleas, he was led to discover the functions of the white corpuscles of human blood. He showed by what mechanism these made perpetual war against the intruding microbes of disease, and he laid the foundations of knowledge as to the agencies that weaken and the modes of strengthening these guardians of our health. In a series of investigations into the phenomena of inflammation in men and lower animals, he carried his observations into new fields, and explained the relations of the white corpuscles to the juices that attract and repel them (chemotaxis). It was he, for instance, who discovered that these corpuscles, under certain circumstances, migrate into the hairs and absorb and remove the pigment, so producing the blanching of old age. Although popularly the most interesting this was far from being the most important of the changes of senile decay that he found to be due to the activity of the wandering cells of the body. And, as will be seen in the present volume, the actions and interactions of the bacteria harboured in the body, the white corpuscles that are a natural part of the body, and the various juices or serums produced naturally or introduced by accident or design, are concerned in life itself and the decay of life.

Metchnikoff is an expert of experts in the science of life, and has gained the right to a hearing by forty years of patient devotion and brilliant research. In the volume that he has now given to the public, he has addressed himself to the gravest and the most serious problems of humanity, to life and sex and death and the fear of death. From the earliest days when man could spare time from the satisfaction of his immediate wants to reflect upon his nature and destiny, these problems and the invention of fantastic solutions or evasive anodynes have absorbed his attention. The folklore and philosophy, the religion and poetry of all races and of all stages of culture, from savage barbarism to decadent refinement, revolve round these obsessions of the mind, and, as Metchnikoff most plainly shows, no enduring comfort has yet been found. Now for the first time in the history of thought, the exact methods of science have been brought to the statement of the problems.

In revising this translation of Metchnikoff's book for the English-speaking public I have had to content myself with seeing that the plain meaning of the French was transformed to plain English, and that references to French editions were changed, so far as was possible, to corresponding references to English editions. Some of the phrases that recur were difficult to express. "Human nature" for instance is not an exact equivalent of *la nature humaine*, for the latter phrase has a complete significance, and very definitely implies not only the mental qualities of man, but his bodily framework, with its inherited and acquired anatomical structure and physiological functions. The phrase "human constitution," especially in the common medical sense, carries more of the meaning, and I have used it occasionally. The word "harmony" means harmony with the environment, and disharmony is want of harmony or imperfect adaptation to the existing environment. In the case of the human organism, which has passed through profound changes at a rate prodigious in the history of evolution, many parts of the constitution are no longer in gear with the existing environment, and it is in such disharmonies that Metchnikoff finds the source of the troubles that have perplexed mankind.

In several parts of this volume, and particularly in the chapter dealing with disharmonies in the reproductive functions, there is much plain speaking on matters that modern civilisation attempts to conceal. I have not had the impertinence to suppress or to alter a line or a word of these pages. They are written in high seriousness on fundamental facts of the constitution of man; they relate to problems and difficulties that every age in the history of man has had to face, and that are dealt with in the plainest language in the books of all the religions. For the first time proper knowledge has been brought to the task, and it is to be remembered that this volume is an attempt to explain mysteries of the flesh and of the spirit of which all existing explanations have failed to satisfy humanity. The volume is avowedly no more than a preliminary statement, a rallying-point for the work of future generations. But it awakens a new hope for humanity now that the old are fallen dumb; as Metchnikoff himself says, "If it be true that man cannot live without faith, this volume, when the age of faith seemed gone by, has provided a new faith, that in the all-powerfulness of science." In every country, the new Order of priests of science, in the vigils of the laboratory, is working for the future of humanity.

P. CHALMERS MITCHELL.

PREFACE

In offering this book to you, reader, I feel that I must justify its publication. I admit freely that more could be said for a finished study in which hypotheses were replaced by exact fact. But to get together assured results in a field so little explored is a great task, calling for time and much labour.

I remembered the adage, "*Ars longa, vita brevis,*" and I decided to publish what is really a programme of work to be carried out as fully as circumstances may permit. At all events, I hope that such a programme may have its value for younger investigators, who wish a point of orientation for their labours.

My book is addressed to disciplined minds, and in especial to biologists. As I wrote it, I had not the general public in my mind, and so I did not hesitate to devote nearly the whole of a chapter to "disharmonies in the apparatus of reproduction." I see in that apparatus the clearest proof of the essential disharmony in the organisation of man.

I have to thank those friends who were familiar with my views and whose advice and assistance have helped me to develop them.

In particular, I desire to thank my friends Dr. E. Roux, who was at the pains to make my French more French; and Dr. J. Goldschmidt and Dr. Mesnil, who have read and revised the proof-sheets.

ÉLIE METCHNIKOFF.

PARIS, *February* 8, 1903.

CONTENTS

Page
EDITOR'S INTRODUCTION iii
AUTHOR'S PREFACE ix

PART I

DISHARMONIES IN THE NATURE OF MAN

CHAPTER I

INTRODUCTION—SUMMARY OF OPINIONS ON THE NATURE OF MAN 1

Importance of the study of the nature of man—The nature of man as the foundation of morality—Greek worship of human nature—Matriopathy of ancient philosophers—Rationalism of the eighteenth and nineteenth centuries—Degradation of human nature by religious doctrines—Influence of these conceptions on actual life and on art—Reaction of the Reformation against the degradation of human nature—Mutilation of the human body by primitive races

CHAPTER II

HARMONIES AND DISHARMONIES AMONGST BEINGS INFERIOR TO MAN 17

The organised world before the appearance of man on the earth—Absence of a law of universal progress—Fertilisation

Page

of vanilla—The part played by insects in the fertilisation of orchids—Mechanism by which insects carry the pollen of orchids—Habits of fossorial wasps—Harmonies in nature—Useless organs—Rudiments of the pollinia of orchids—Disharmonies in nature—Unadapted insects—Aberration of instincts—Perversion of sexual instinct—Attraction of insects by light—Luminous insects—Law of natural selection—Happiness and unhappiness in the organised world

CHAPTER III

SIMIAN ORIGIN OF MAN 40

Relationship of the human species with anthropoid apes—Analogies in the dentition, in the organisation of the limbs and of the brain—Resemblance of the vermiform appendage of man and anthropoids—Analogy between the placenta and fœtus of man and anthropoid apes—Blood relationship of man and monkeys shown by serums and precipitates—Transmutation of species—Sudden transition from monkey to man—J. Inaudi, the calculator, as an example of the sudden appearance of characters in the human species—Rudimentary organs in man—Proportion of progressive and retrogressive organs in the organisation of man

CHAPTER IV

DISHARMONIES IN THE ORGANISATION OF THE DIGESTIVE SYSTEM OF MAN 61

Perfection of the human form—The covering of hair—the dentition in general, and the wisdom-teeth—The vermiform appendage—Appendicitis and its gravity—Uselessness of the cæcum and of the large intestine—Instance of a woman without a large intestine—Ancestral history of this portion of the digestive tract—Injurious effect of the microbes of the large intestine—Frequency of cancer of the large intestine and of the stomach—Limited usefulness of the stomach—The instinct of choice of food—Futility of this instinct in man

CHAPTER V

Page

DISHARMONIES IN THE ORGANISATION AND ACTIVITIES OF THE REPRODUCTIVE APPARATUS—DISHARMONIES IN THE FAMILY AND SOCIAL INSTINCTS 78

I

Remarks on the disharmonies in the human organs of sense and perception—Rudimentary parts of the reproductive apparatus—Origin and function of the hymen

II

Evolution and significance of the menstrual flow in women—Precocious marriage amongst primitive and uncivilised races—Disharmony between age of puberty and age of nubility—Age of marriage—Examples of disharmony in the development of the reproductive function

III

Disharmonies in the family instincts—Artificial abortion—Desertion and infanticide—Disharmonies in the social instincts

CHAPTER VI

DISHARMONIES IN THE INSTINCT OF SELF-PRESERVATION . . . 113

The instinct of self-preservation in animals—Man's instinctive love of life—Indifference to life during childhood—Buddhist legend on instinctive self-preservation and the fear of death—Fear of death treated in literature—Confessions of Tolstoi regarding the fear of death—Other opinions on the subject—The fear of death an instinctive phenomenon—Development in man of a love of life—Treatment of the aged—Murder of old people—Suicide of old men—Absence of harmony between the love of life and the conditions of human existence—The part played by the fear of death in religions and systems of philosophy

PART II

ATTEMPTS TO DIMINISH THE ILLS ARISING FROM THE DISHARMONIES OF THE HUMAN CONSTITUTION (RELIGIOUS AND PHILOSOPHICAL SYSTEMS)

CHAPTER VII

Page

Religious Attempts to Combat the Ills Arising from the Disharmonies of the Human Constitution 137

Animism as the foundation of primitive religions—The Jewish religion in relation to the doctrine of immortality of the soul—The religions of China—Ancestor worship in Confucianism—The conception of immortality in Taoism—The persistence of the soul in the Buddhist religion—The paradise of the Chinese Buddhists—Ancestors worshipped as gods—Influence of religious faith on the fear of death—Pessimism of the doctrine of Buddha—The meaning of Nirvâna—Resignation as preached by Buddha—Objections to immortality of the soul—Irritability of the tissues and cells of the body—Religious hygiene—Religious means of controlling the reproductive functions and of preventing diseases—Failure of religions in their attempts to combat the ills arising from the disharmonies of the human constitution

CHAPTER VIII

Attempts in Systems of Philosophy to Remedy the Ills Arising from the Disharmonies of the Human Constitution 166

Some philosophical systems are in intimate union with religions—Ideas of ancient philosophers on the immortality of the soul—The teaching of Plato—The scepticism of Aristotle—The Stoics—Cicero, Seneca, Marcus Aurelius—Modern philosophical systems—Pessimism and its origin—Lord Byron—Theories of Schopenhauer and Hartmann—Mailaender's philosophy of deliverance—Criticisms of pessimism—Max Nordau—Ideas of modern thinkers on death

PART III

WHAT SCIENCE IS ABLE TO DO TO ALLEVIATE THE DISHARMONIES OF THE HUMAN CONSTITUTION

CHAPTER IX

Page
WHAT SCIENCE CAN DO AGAINST DISEASE 203

Formation of the experimental method—The intervention of religion in disease—Disease as a basis of pessimistic systems of philosophy—Advance of medical science in the war against disease—The revolution in medicine and surgery due to the discoveries of Pasteur—The beneficial results of Serum Therapy in the war against infectious diseases—Failure of science to cure tuberculosis and malignant tumours—Protests against the advance of science—Opposition of Rousseau, Tolstoi and Brunetière—Proclamation of the fallibility of science—Return to religion and mysticism

CHAPTER X

INTRODUCTION TO THE SCIENTIFIC STUDY OF OLD AGE . . . 228

General account of old age—Theory of senile degeneration amongst unicellular organisms—Conjugation amongst infusoria—Old age in birds and in anthropoid apes—General characters of senile degeneration—Sclerosis of the organs—Phagocyte theory of senile degeneration—Destruction of higher elements by macrophags—Mechanism of whitening of the hair—Serums acting on cells (cytotoxins)—Sclerosis of the arteries and its causation—Harm done by the microbes of the alimentary canal—Intestinal putrefaction and the modes of preventing it—Attempts to prolong human life—Longevity in biblical times

CHAPTER XI

INTRODUCTION TO THE SCIENTIFIC STUDY OF DEATH . . . 262

Theory of the immortality of lower organisms—Immortality of the sexual cells in higher organisms—Immortality of the

cellular soul—Occurrence of natural death in the case of certain animals—Natural death in the Ephemeridæ—Loss of the instinct of preservation in adult Ephemerids—Instinct of life in the aged—Instinct of natural death in man—Death of old men in biblical times—Changes in the instincts of man and lower animals

CHAPTER XII

SUMMARY AND CONCLUSIONS 285

Disharmonies in the human constitution as the chief source of our sorrows—Scientific data as to the origin and destiny of man—The goal of human existence—Difficulties in the way of scientific investigation of the problem, What is progress?—Difficulty of including the whole human rate in a scheme of progress and morality—The instincts of life and of natural death—Application to real life of the doctrines set forth in this book

ILLUSTRATIONS

Photograph of Elie Metchnikoff . . . . *Frontispiece*

Figs. *Page*

1. *Catasetum saccatum* 24
2. *Herminium monorchis* 26
3. *Cerceris* 28
4. *Listera ovata* 32
5. *Pelopæus* 34
6. Cæcum and vermiform appendage of man 44
7. Cæcum and vermiform appendage of chimpanzee . . . 45
8. Fœtus of gibbon 46
9. Human fœtus 47
10. Fœtus of gorilla 50
11. Human fœtus 51
12. *Paramecium* about to divide 230
13. Conjugation of *Paramecia* 231
14. Section of a renal tubule invaded by Macrophags . . . 241
15. Brain cells devoured by Macrophags 241
16. Hair becoming grey 243
17. *Chætogaster* about to divide 265
18. Ephemerids 271
19. Swarms of *Palingenia virgo* 273
20. Larva of an Ephemerid 276

THE NATURE OF MAN

PART I

DISHARMONIES IN THE NATURE OF MAN

CHAPTER I

INTRODUCTION

SUMMARY OF OPINIONS ON THE NATURE OF MAN

Importance of the study of the nature of man—The nature of man as the foundation of morality—Greek worship of human nature—Matriopathy of ancient philosophers—Rationalism of the eighteenth and nineteenth centuries—Degradation of human nature by religious doctrines—Influence of these conceptions on actual life and on art—Reaction of the Reformation against the degradation of human nature—Mutilation of the human body by primitive races

NOTWITHSTANDING the real advance made by science, expressions of discontentment with it are familiar. Science, it is said, no doubt has ameliorated the material conditions of human life, but is powerless to solve those moral and philosophical questions that interest cultured people so deeply. In this region science has done no more than to destroy the foundations of religion. It has robbed mankind of the consolations of religion without being able to replace them with anything more exact or more enduring.

It cannot be disputed that a general uneasiness disturbs the world of to-day. Although his environment is most favourable to the fulfilment of many of his capacities, man finds himself without orientation when he has to determine the course of his life, or to explain to himself his true relation to such categories of humanity as family, nation, race and human race. This uneasiness reveals itself as discontentment, and it leads to pessimism or to mysticism. Most of the philosophical systems of the nineteenth century were steeped in melancholy, and led straight to a denial of the possibility of happiness and even to an advocacy of extinction. The frequency of suicide has increased greatly among all the civilised peoples. There is no need to tabulate proofs of a notorious fact.*

A remedy for this malady of the age has been sought in the attempt to restore religious and mystical faith. On all sides have sprung up efforts to found new religions or to amend the old. Many defenders of science have gone the length of admitting its incapacity to solve the problem of the existence of man; they have held that that problem was insoluble for the human mind. Such a depressing conclusion has been formulated in spite of many attempts to reach a rational conception of the universe and of man.

It is no new thing to ask if there be nothing but faith to control human conduct and to lead mankind towards universal happiness. Men of science and philosophers, in many ages, have thought that human nature itself could provide all the materials for a rational morality.

In the ancient world and, above all, among the Greeks, human nature was held in high esteem. The Oriental races, predecessors of the Greeks in civilisation, generally represented their gods as fantastic or grotesque beings, composites of men and animals. The Greeks made gods in their own image, giving them all the most beautiful qualities of the human race. Such a conception was a dominant factor in ancient Greek life and civilisation. The adoration of Man embraced the human body, and led to the despising of every mode of tampering with the natural body. Thus, for instance, shaving * of the face was regarded as a humiliation, for a smooth chin gave an unnatural, womanish cast to the face of a man.

---

* Since A. Wagner's classical work, "Ueber die Gesetzmässigkeit der scheinbar wilkürlichen menschlichen Handlungen," suicide has been discussed by many authors. The most recent contribution to the subject is the important monograph by Westergaard, "Die Lehre von der Mortalitæt u. Morbiditæt," Second Edition, Jena, 1901.

The adoration of human nature by the Greeks appeared in Greek plastic art, and was the cause of its excellence. The ideal of art was to copy, in the most faithful way, the most perfect example of the human body, and Greek artists made measurements of the body so accurately that modern science has confirmed their chief results.† As sculpture most completely realised the Greek ideal of the human body, it became almost a national art among the Greeks.

Greek philosophy had an equally high opinion of human nature, of the human body, and of representations of the human body. Just as Greek art aimed at the presentation of the body of man, so Greek philosophy proclaimed the nobility of all human qualities, and inculcated the doctrine of a harmonious development of all sides of human nature.‡ Such a doctrine was formulated by Plato, and became a fundamental principle of the Old Academy; the New Academy assumed it, and handed it on to the Sceptics. According to Xenocrates (fourth century), who

---

* Shaving the beard began at the time of the Macedonian rule, and philosophers refrained from the new custom, which seemed to them unprincipled. (V. Hermann, "Lehrbuch der griechischen Privatalterthümer," 1870, vol. I., pp. 175-177.)

† Quetelet, "Anthropomètrie," 1872, p. 86.

‡ Zeller, "Die Philosophie der Griechen," Third Edition, vol. II 1, p. 741, 1875.

belonged to the Old Academy, happiness consisted not only in the possession of human virtue, but in the accomplishment of all natural acts.*

The principle of a worship of human nature is in itself rather vague, and it is not surprising that disputes and contradictions arose in relation to its application. Thus Plato excluded pleasure from his conception of the good, while Aristotle, Plato's pupil, held a contrary opinion. For the latter pleasure was the natural motive of human action, and its attainment was associated as intimately with the perfect life as beauty and health were associated with the perfect human body.†

Under the name *Matriopathy* there arose, in the ancient world, a doctrine the object of which was the study of the goal of natural morality. This doctrine was held by many philosophers, but these applied it to the details of actual life in very different fashions. Thus, for the Stoics, the *summum bonum* and happiness, the most lofty aim, could not be found except by conforming life to nature. Conduct was to be brought into harmony with the rational order of nature in such a fashion that every conscious and rational being would perform no actions that could not be deduced from the general law.‡ The same principle of a life in harmony with nature led the Epicureans to the conclusion that "pleasure is a natural good, that is to say, a condition conformable with nature, and so bringing with it intrinsic contentment."§ Setting out from the same fundamental principle, the theories of the Stoics and Epicureans led in opposite directions.

---

* Zeller, *l.c.* p. 880.

† Zeller, vol. II., 2, p. 447.

‡ Zeller, First Edition, vol. III., 7, p. 193

§ Zeller, *l.c.* p. 401.

The Roman philosophers adopted the principle of a life strictly natural. Seneca, for instance,* enunciated the maxim: "Take nature as your guide, for so reason bids you and advises you; to live happily is to live naturally."

Without following through the centuries the development of the idea in detail, I may content myself with saying that resort has been made to it, wherever there was sought, outside the sanction of religion, a rational principle to guide human conduct. It recurs even among those convinced Christians who rebelled against the asceticism and hatred of human nature that became prevalent in the early centuries of the Christian era.

The Greek conception of a life in harmony with nature found its most complete development in the rationalism of the Renaissance, and of the centuries that followed it. Hutcheson,† a Scotch philosopher of the eighteenth century, insisted that right was with the thinkers of the naturalistic school, and that the realisation of their ideal was to be considered as the highest virtue. He thus placed himself directly against the Scotch clergy who asserted the greatest contempt for human nature. Buckle ‡ proclaimed that it was a high honour for Hutcheson to have been the first Scotchman to raise his voice publicly against the degrading views of his time.

The French philosophers of the eighteenth century, who sought to replace the religious foundations of conduct by rational principles, again had recourse to human nature. Not long before the French Revolution there appeared a treatise in three volumes, written by Baron d'Holbach, and entitled, "Universal Morality, or the Duties of Man based on Nature."* Frankly a materialist and atheist, that writer laid it down as an axiom that "to be universal, the moral law must be founded on the essential nature of man, that is to say, on the properties and qualities found constantly in the human being, and that distinguish him from other animals." To be well assured, "morality presumes a science of human nature." †

---

* "De Vita Beata," chap. viii.

† "Moral Philosophy," London, 1755.

‡ Buckle, "History of Civilisation in England."

The principle of ancient philosophy reappeared in the works of rationalists of the nineteenth century. Wilhelm von Humboldt declared that "the ultimate ideal of man, the ideal prescribed for him by the irrefutable and eternal laws of reason, consisted in a development as harmonious as possible of all his qualities in their entirety." The modern historian, Lecky,‡ defines the aim of life as the full development of all that exists in the proportions determined by nature.

Philosophers and historians are not alone in the adoption of Greek rationalism. Many naturalists, and among these some very distinguished authors, have spoken in the same sense. It is easy to see the Greek principle in such phrases as those of Darwin § when he wrote: "The term general good may be defined as the means by which the greatest possible number of individuals can be reared in full vigour and health, with all their faculties perfect, under the conditions to which they are exposed."

Georges Seidlitz, || an advocate of the great English naturalist, got still nearer to the conception of the ancients.

---

* Published at Amsterdam in 1776. † Vol. I., p. 32.

‡ "History of European Morals," Third Edition, London, 1877.

§ "The Descent of Man and Selection in Relation to Sex," First Edition, vol. I., p. 98.

|| "Die Darwin'sche Theorie." Second Edition, 1875, p. 272, note 25.

According to him, the moral and rational life consisted in "the accomplishment of all the functions of the body, in due but full proportion."

Herbert Spencer,* in analysing the aim of existence, came to the conclusion that morality should be adjusted so as to make life as full and complete as possible. As a criterion of physical perfection, the English philosopher would accept only the complete devotion of all the organs to the accomplishment of all their functions, while his criterion of moral perfection was contribution to the general good. These views are plainly, if not exactly, expressions of the Greek ideal.

While, then, rational philosophers in all the ages have sought the foundation of morality in human nature itself, and have held human nature to be good, or even perfect, many religious doctrines have displayed a very different view. Human nature was regarded as being composed of two hostile elements, a body and a soul. The soul alone was to be honoured, while the body was regarded as the vile source of evils. Such a view led to the flagellations and torturings of the body which form so strange and so wide-spread a phenomenon. The Hindu fakirs who swing themselves on hooks, the dervishes and Mussulman Assouans who beat in their skulls with clubs, the Russian Skoptsy who emasculate themselves, and many other instances make it plain that natural perfection is not taken as the basis for conduct.

Buddha † in the clearest way showed his belief that human nature was base. Coming out from the apartments of the women, there came to him a "vivid idea of the impurity of the body, a feeling of repulsion from it, and of blame of it; regarding his own body and seeing its wretchedness, he began to despise it, and to formulate conceptions of impurity and purity; *from the sole of the feet to the crown of the head, to the limit of the brain, he saw that the body was born in impurity, came from impurity, and always let itself be drawn to impurity.*" These reflections led him to the conclusion: "What wise man, having regarded his own body, will not see in it an enemy?"

---

* "The Data of Ethics," 1879.

† The "Lalita Vistara," translated from Sanscrit into French by Foucaux; "Annales du Musée Guimet," vol. VI. p. 183. 1884.

Towards the end of the old world, the Greek theory of human nature yielded to a very different conception. The opposition between the opinions of the Stoics on morality, and their admiration of human nature, led Seneca, one of the last Roman Stoics and a celebrated contemporary of Jesus Christ, to break completely away from the ancient doctrine. Convinced of the moral weakness and imperfection of man, and of the persisting power of evil, Seneca declared that human nature contained a vicious and essentially evil element. This element was seated in the body, which he regarded as so essentially vile that it is to be despised. Our body was no more than the dwelling of the soul, its temporary home, a place in which it cannot be at rest. The body was a burden which the soul would be rid of, a prison-house from which it would escape. According to Seneca * the soul must wrestle with the body, for the body brings to it nothing but suffering, while the soul is essentially pure and spotless, and as much above the body as divinity is above matter.

A dualism still more pronounced was characteristic of the early Christian view of human nature, and led to the depreciation of the body as compared with the soul. In the fourth and fifth centuries of our era such a view was so dominant that a struggle against the material side of our nature became a rule of life. The most absolute asceticism spread throughout the Christian world.* A struggle against hunger, thirst, and desire for sleep, rejection of all pleasures that come from impressions of sight, of hearing, or of the palate, and, above all, abstention from sexual intercourse, became, in the opinion of believers, the true aim of human life. The conviction that human nature was essentially corrupt led to a declaration of war against it; all the pleasures were forbidden, even the most innocent of them being thought vicious. What could be more in contrast with the calm and joyous philosophy of the Greeks, for whom there did not exist the idea of a struggle against the supposed corruption and imperfection of man? The dualistic theory made such demands on its proselytes that these, absorbed in the salvation of their souls, sank from the physical point of view to the level of wild beasts. Hermits resorted to the lairs of animals, abandoned their clothing and went about naked with shaggy and disordered hair. In Mesopotamia and a part of Syria there arose a sect of eaters of grass; these were people who had no dwellings and who ate neither bread nor vegetables, but wandered on the hills and fed on the herbage. Cleanliness of the body was regarded as an indication of corruptness of the soul, and among the most highly venerated of the saints were those who took no care of the body. Athanasius relates with approval that when St. Antony, the father of monks, became old he never washed his feet.†

---

* Zeller, *loc. cit.* p. 633.

Such doctrines soon brought about a most serious perversion of the innate instincts of the human race. The senses of family and of society became so weakened that fanatical Christians were more than indifferent to their kinsmen and countrymen. One saint was venerated because he was hard and cruel only to his relatives. It is told of the Abbot Siseuss that on a believer asking to be received into the convent, he inquired if the suppliant had any one akin to him. "I have only a son," said the Christian. "Well, then," said the abbot, "take your son and cast him into the river, for thus only may you become a monk." The father set about to do the bidding of the abbot, and it was only at the last moment that the order was recalled. For admission into a Christian community it was necessary to renounce one's country.*

---

* Lecky, "History of European Morals," chap. iv.

† Lecky.

Such ideas have struck a deep and enduring root. In the opinion of the ministers of the Scotch Church of the seventeenth century, according to Buckle,† there was nothing so surprising as that the earth could contain itself in the presence of that horrid spectacle, man, and that it did not gape, as in former days, to swallow him in the midst of his wickedness. For certainly, in the created universe, there could be nothing so monstrous and so horrible as man.

It was to be expected that when such conceptions prevailed, celibacy and repudiation of the reproductive instinct should have been made obligatory on the clergy. The words, reported by St. Matthew (xix. 11, 12), that "there be eunuchs who have made themselves eunuchs for the kingdom of heaven's sake" were interpreted by some as implying a voluntary renunciation of marriage, while others insisted on the literal meaning and in consequence mutilated themselves more or less completely. The breasts of women were removed to eradicate the maternal instincts. But it is only the sect of Skoptsy, by no means a small body in Russia, that applies the gospel command in this stringent fashion. The wish announced by St. Paul (Corinthians vii. 7), "I say therefore to the unmarried and widows, it is good for them if they abide even as I; but if they cannot contain, let them marry, for it is better to marry than to burn," soon became a command, and since the fourth century the Catholic Church has advocated celibacy of the clergy, although it was not enforced until the eleventh century (under Gregory VII.). A low view of human nature has survived in the Catholic Church even to our own times. Pope Leo XIII., in his "Encyclical on Freemasons," proclaimed it.* "Human nature," he said, "was contaminated by the Fall, and as it is therefore much more prone to vice than to virtue, in order to attain virtue it is absolutely necessary to restrain the wild impulses of the soul, and to control the appetites by reason."

---

* Lecky.

† Buckle, "History of Civilisation in England."

Art has reflected the Christian conception of human nature. Sculpture, which played so great a part in the ancient world, and which was intimately associated with Greek ideals, began to decline rapidly in the Christian era. It lasted longer in the Roman Empire of the East, but in Italy it was almost completely forgotten by the eighth century. Painting survived, but not without undergoing an extraordinary degeneration. All the Italian works of art of the Carlovingian period, displayed the utmost indifference to natural form, and a loss of the sense of harmony and beauty. Later on, Italian art fell lower still. "No one dreamed any longer of studying nature or of observing the human body. An epoch in which the interference of supernatural forces was generally accepted, and in which the conception of the universe was founded on a contrast between the natural and the supernatural, could not admit in its art the rule of natural law or a natural order of events." *

---

* "De Secta Massonum," Parisiis, 1884, p. 9. The passage was quoted by Brunetière in the "Revue des Deux Mondes," 1895, vol. CXXVII., p. 116.

The intimate connection between the depreciation of human nature due to Christian doctrine and the inferiority of the art of the middle ages cannot be denied. Taine † writes of the period as follows: "If one considers the stained-glass windows or the images in the cathedrals, or the rude paintings, it appears as if the human race had become degenerate and its blood had been impoverished; pale saints, distorted martyrs, virgins with flat chests, feet too long and bony hands, hermits withered and unsubstantial, Christs that look like crushed and bleeding earthworms, processions of figures that are wan, and stiffened, and sad, upon whom are stamped all the deformities of misery and all the shrinking timidity of the oppressed."

The art of the middle ages fell lower and lower until the Renaissance, with its return to the Greek ideal, brought new vigour. The great masters of the Renaissance were in addition scientific men who had studied mathematics and who employed the technique of mensuration; such were Alberti, Leonardo da Vinci, Michel Angelo, and others. The return to the Greek ideals and to nature brought with it the taste for beauty.

When the ancient spirit was born again, its influence reached science and even religion, and the Reformation was a defence of human nature. The Lutheran doctrines resumed the principle of a "development as complete as

---

* Schnaase, "Geschichte der bildenden Künste, vol. III., pp. 577, 584, and vol. IV., p. 718.

† "Philosophie de l'Art," Fourth Edition, 1885, vol. LXXXVIII., p. 352.

possible, of all the natural powers" of man, and saw in that ideal a guide for humanity. Compulsory celibacy was abolished, and free play was given to all the tendencies in conformity with the laws of nature.*

Besides those whose religion led them to despise the human body, there have been many savage races and tribes who have practised mutilations of the body. It would be a long list were I to set out all the modes in which the human body has been disfigured. Treatises on Ethnography and the volumes of travellers contain a multitude of details of this sort. The hair, the teeth and the lips have been subjected to treatment with the object of making them as unlike the natural condition as is possible. Many of the lower races discolour their teeth, or remove some of them, or file them to points. Others insert in the lips pieces of wood, of stone, or of bone. A whole chapter might be occupied with an account of the disfiguring devices of tattooers. The skull, the breasts, and the feet, have all been subjected to deforming treatment.

Although there is not enough evidence to set down these practices to the existence of definite and self-conscious religious or philosophic doctrine, it is at least certain that the people among whom they occur are far from revering human nature in the fashion of the Greeks, but rather attempt to distort it in accordance with their own taste. Discontent with the natural conditions of existence is, as we have seen, so widespread that there is good reason for an inquiry as to the existence of some general principle underlying this diversity of opinion regarding human nature. I have already shown that this question of human nature has for long interested mankind, and has shared largely in the formation of ideas of the good and the beautiful. It is not too soon to submit the problem to rational investigation, using those rigid methods of science which have been learned in our epoch. I shall try to give an exposition of human nature in its strength and in its weakness. But before passing to man, I shall survey the lower forms of life, hoping to fix some landmarks that will be useful in the study of the larger problem.

---

* Reinhard, "System der christlichen Moral," vol. IV., 1814, p. 831, and vol. III., p. 14, 1813.

CHAPTER II

HARMONIES AND DISHARMONIES AMONGST BEINGS INFERIOR TO MAN

The organised world before the appearance of man on the earth—Absence of a law of universal progress—Fertilisation of vanilla—The part played by insects in the fertilisation of orchids—Mechanism by which insects carry the pollen of orchids—Habits of fossorial wasps—Harmonies in nature—Useless organs—Rudiments of the pollinia of orchids—Disharmonies in nature—Unadapted insects—Aberration of instincts—Perversion of sexual instinct—Attraction of insects by light—Luminous insects—Law of natural selection—Happiness and unhappiness in the organised world

LONG before man appeared on the earth animals and plants were distributed over it. Some of these were endowed with but vague senses, while others had well-developed instincts, and some even a certain degree of intelligence which they applied for their self-preservation and for the propagation of their own kind.

Many species, well adapted for the resistance of external influences, have survived from very early times to the present day. In the Carboniferous period birds and mammals did not yet exist, and the thick forests, with undergrowths of gigantic ferns, were inhabited by large numbers of articulated animals, amongst which were scorpions and insects. The scorpions of that time resemble in every way those that actually live at the present day in tropical countries; and amongst the insects of that early epoch were some very like the cockroaches of to-day. Certain tree-like ferns of the present time are also very similar to those of the coal period. Amongst the animals the bodies of which are protected by a shell, such as foraminifera and mollusca, certain species have survived even from an earlier time than the coal period.

In contrast with this extraordinary survival, there are instances of the complete disappearance of numbers of species of animals and plants. In early times, during the Tertiary epoch, the virgin forests of Europe were inhabited by a large number of monkeys, of which fossil remains are now found, especially in Greece. These formerly existed even in Europe, and some anthropoid apes (*Dryopithecus*) have left traces in the tertiary deposits of France.* These animals, notwithstanding that their organisation was superior to that of scorpions and cockroaches, have not been able to adapt themselves to the altered conditions of modern Europe. A similar fate has come upon some of the higher mammals, such as the mammoth and the mastodon.

✓ These facts do not bear testimony to the prevalent idea that there exists in nature a law of universal progress tending to the production of organisms more and more perfect from the point of view of complexity of structure. It is incontestable that forms higher in the scale of life have developed only after the appearance of lower forms. But it does not follow that development always takes a progressive march. Man is one of the later species that have appeared upon the earth, but there are others of still more recent date. It is very probable that certain species of lice have appeared subsequent to man, particularly the clothes-louse (*Pediculus vestimenti*). Amongst the true parasites which live only ✓ in the human body are some that have acquired their specific characters after the appearance of man. Such are certain tape-worms and microbes, such as a species of *gonococcus*. It is therefore amongst parasites and not to man that we must look for the latest products of creation.

---

* Gaudry, "Mammifères tertiaires," p. 235, 1878.

In nature, then, there is no blind tendency towards progress. Organisms almost innumerable are born every day with variable characters. Those amongst them which are adapted to existing circumstances survive and produce offspring like themselves, but many do not reach maturity, and, living only for a short time, die without leaving issue.

To give the reader a better idea of adaptations and of their importance to living creatures, it will, perhaps, be as well to devote some space to an account of examples of them. Amongst organisms that attract our attention by their pleasing aspect, there are not many that can rival flowering plants. Every one admires the great beauty of the blossom of orchids. There can be no doubt that these flowers have not been developed to satisfy the æsthetic tastes of man, for the simple reason that orchids existed for a long time before man's appearance.

Among orchids there is one which, for more than half a century, has been cultivated by man in many tropical countries. This is the Vanilla, the fruit of which produces one of the sweetest of spices.

In former days the pods of only the wild vanilla, which is an undergrowth of the forests of Mexico and South America, were gathered. But the employment of vanilla to flavour chocolate has rendered its artificial culture lucrative; consequently the plant has been transported to several warm countries where it could be acclimatised. It has flourished and borne numerous blossoms, but it has never produced fruit from which alone the aroma is obtained. As the question of the sterility of the vanilla was of great practical interest to the cultivator, the matter was investigated, and it was found that the flower remained sterile because the female and male parts could not come in contact. The pistils and stamens of the flower are well developed, but between these sexual organs is a membrane which prevents fertilisation. After this discovery was made, the idea occurred that the pollen of the vanilla flower might be transferred artificially to the stigma of the pistil so as to bring about "artificial" fertilisation. A young black slave, Edmond Albius, a native of Réunion, discovered in 1841 a practical method by which the male and female elements of the vanilla could be put in contact; and from this discovery there came a great extension of the cultivation of the orchid in many countries. At a certain period a small bamboo point or the tooth of a comb is introduced into the vanilla flower, and in this way, in a short time, a quantity of flowers may be fertilised and so made capable of bearing mature pods.*

In the original home of the vanilla the intervention of man is unnecessary. In Guiana and Mexico fertilisation of the flower is the work of small bees (of the genus *Melipona*). They frequent the vanilla flowers to extract nectar, the material of their honey. Small humming-birds also hover over the vanilla blossoms, and by introducing their bills into the sexual organs of the flowers bring about contact of the male and female elements.

Sterility of the vanilla in the countries to which it has been introduced, before the employment of artificial fecundation, is easily explained by the fact that in these countries there are no insects nor humming-birds capable of transporting the pollen.

But it is not only the vanilla that requires the co-operation of living beings to produce its fruits. It is the case with many other orchids. In the flowers of these the pollen is massed together and cannot be transported by the air. It needs the aid of insects, as had already been pointed out by Sprengell in the eighteenth century, and above all by Darwin, whose splendid investigations are the basis of the following passages.*

---

* Delteil, "La Vanille," Paris, 1897.

Insects, belonging to different groups, such as bees, wasps, flies, certain beetles, and many butterflies and moths, visit orchids to sip the nectar produced by the plants and stored in definite parts of the flowers. In order that their proboscis may reach the stores of sweet juice, the insects inevitably touch first the upper parts of the flowers, where the anthers are present. The pollen grains are clustered in masses, known as pollinia, and these adhere to the body of the visiting insect by means of an adhesive fluid which is secreted by an organ of the flower known as the *rostellum.* In this way the pollinia adhere firmly, it may be to the proboscis of butterflies, or to the head or any other part of the body of insects. They can leave the flower and fly away without losing the adhering pollinia, and in this manner they serve as the agents for sexual contact and for fertilisation of the orchids. Ménière relates that a person who kept bees near the garden of the Faculté de Toulouse complained that they returned from the garden with their heads covered with tiny yellow bodies which he was unable to clean off from them. It was easy to recognise in these bodies the pollinia of orchids very firmly attached to the bees' heads.†

---

* Darwin, "The Fertilisation of Orchids," Second edition, London, 1877. See also Müller, "Die Befruchtung der Pflanzen durch Insecten," pp. 74–85, Leipzig, 1873.

† *Bulletin de la Société botanique de France,* vol. I., p. 370, 1854.

When an insect, bearing these pollinia, introduces itself into another flower of the same species of orchid, it inevitably comes in contact with the female apparatus, more particularly with the viscous surface of the stigma. Some of the grains of pollen contained in the pollen-mass adhere to the stigma and are thus enabled to fertilise the ovule. This carriage of pollen from one flower to another brings about a crossing which is necessary for the production of good seed. On the other hand, the seed which is the result of self-fertilisation of a flower is inferior.

An examination of the structure and form of the flowers of many orchids show that they are adapted in a truly marvellous way to the visits of insects that convey pollen. In each part of these flowers one can discern some useful arrangement to secure cross-fertilisation.

For the proper transmission of pollen it is necessary that the pollinia should adhere very firmly to the body of the insects, and that the viscous substance which holds them together should have time to solidify. It is thus of great advantage to the plant if the insects remain for a considerable time on the flower. In several orchids the nectar is not easily accessible, and frequently the insect has to search for a long time before finding what it desires, and sometimes it even has to pierce a membranous covering before reaching the fluid. The operation takes a certain time, and this is long enough to allow the mucus by which the pollinia adhere to the insect to set firmly.

In the case of orchids the mucus of which sets instantaneously, there is no reason for the visit of the insect to be prolonged. In such cases the nectar is easy to extract, and the insect finds it without loss of time.

Darwin, after describing these facts, proceeds to say: *

---

* *Loc. cit.* p. 44.

"In these five species" (in which the viscid matter "is so adhesive that it serves to attach the pollinia firmly to the insects without getting hard"), "and in these alone, we find copious nectar ready stored for rapid suction in open nectaries. On the other hand, whenever the viscid matter gets hard by exposure for a short time to the air, it would manifestly be advantageous to the plant if insects were delayed in obtaining the nectar; and in all such species the nectar is lodged within intercellular spaces, so that it can be obtained only by the inner membrane being penetrated at several points, and this will require time. If this double relation is accidental, it is a fortunate accident for the plants; but I cannot believe it to be so, and it appears to me one of the most wonderful cases of adaptation which has ever been recorded."

Some orchids secrete instead of nectar a clear liquid like water. This fluid is collected in a petal inserted at the lower part of the flower and shaped into a deep cup-shaped receptacle. It does not attract insects, but by wetting their wings compels them to leave the flower by a different exit which passes close to the reproductive organs (*i.e.*, the anther and the stigma). The soft linings of the cup are greedily devoured by certain insects, particularly by bees. Dr. Cruger, who observed this, has often seen bees fall into the cup whereupon their wings became so wet as to prevent their flying away, and they have been obliged to get out by the channel that carries off the waste from the reservoir. As the saturated bees creep along the narrow passage after their involuntary immersion, they come inevitably in contact with the stigma and the masses of pollen. The latter adhere to the bodies of the bees and can be conveyed to the sticky stigma of a neighbouring flower.

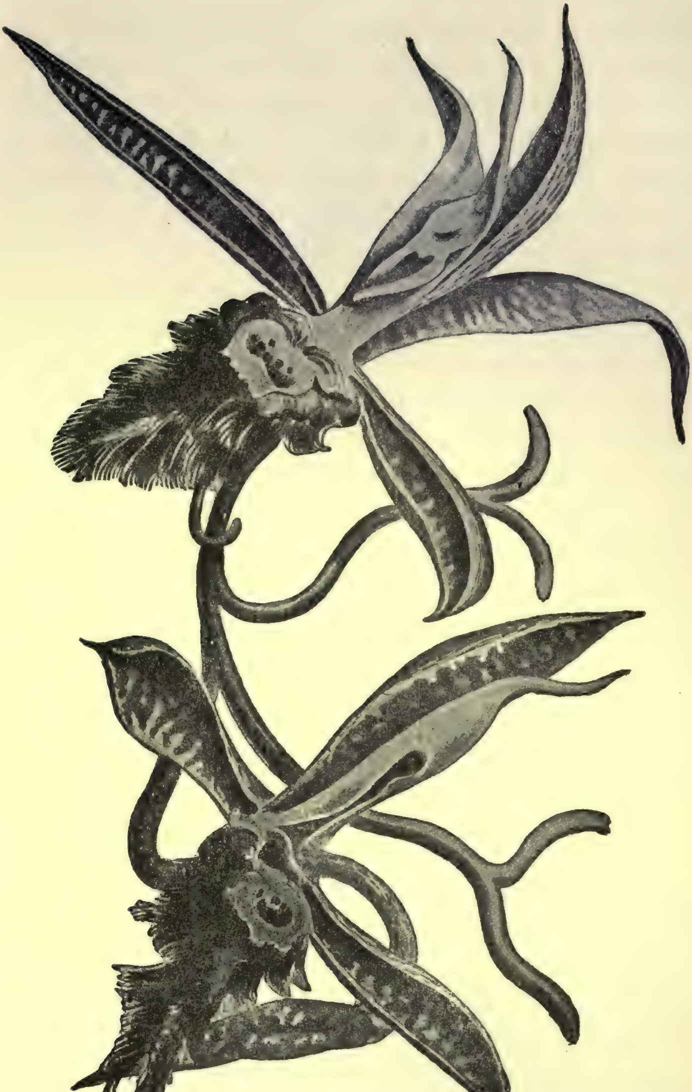

FIG. 1.—*Catasetum saccatum* (from " La Lindenia," Gand, 1890).

In other orchids (*Catasetum*, Fig. 1), the male elements are discharged by a spring-like arrangement on the body of insects. When certain parts of the flowers are touched, the pollinia are thrown off like arrows, which, in the place of the barbs, have viscid swellings. "The insect, disturbed by so sharp a blow, or after having eaten its fill, flies sooner or later away to a female plant and, whilst standing in the same position as before, the pollen-bearing end of the arrow is inserted into the stigmatic cavity, and a mass of pollen is left on its viscid surface." *

After giving detailed descriptions of the cross-fertilisation of flowers by such peculiar means, Darwin makes the following remark: "Who would have been bold enough to have surmised that the propagation of a species depended on so complex, so apparently artificial, and yet so admirable an arrangement?" †

One orchid (*Herminium monorchis*, Fig. 2), which bears very small flowers, is remarkable for the way in which it is fertilised by insects. Only very small insects are able to penetrate the flowers. The space being very limited these minute insects can enter the flower only in a particular way, and at one of the corners. This causes the pollinia to become attached always to the same place, which is on the outer side of one of the two front legs. When the insect, the carrier of the pollinia, enters a second flower, it can scarcely fail to fertilise the stigma, which is on the corresponding side. Darwin said that it would be difficult to find a case in which there was so marvellously complete an adaptation to a very peculiar mode of fertilisation as the little flower of *Herminium*.

In addition to orchids, there are other flowers the organisation of which is adapted in a remarkable way to

---

* Darwin, *loc. cit.* p. 179.

† *Ibid.* pp. 207–208.

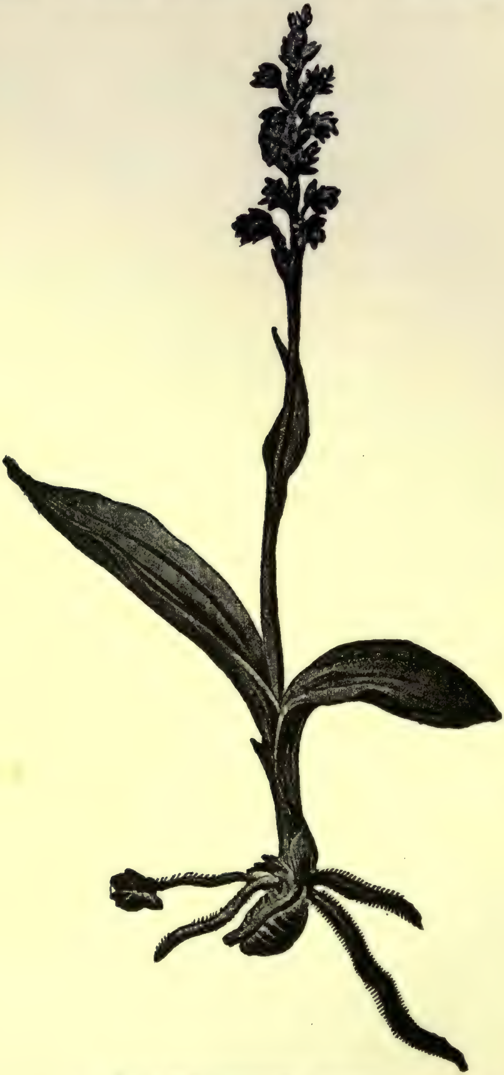

FIG. 2.—*Herminium monorchis*
(after Sowerby, "English Botany," ix. 1869)

fertilisation by insects. But to find perfect harmony in the nature of living beings it is not necessary to confine our observations to flowers. The animal world furnishes us with numerous examples. To avoid going into the details of these, I shall content myself with a description of the most remarkable instances.

Every one has seen, flying near the ground, small, slender, and pretty wasps. From time to time these bury themselves in the earth or sand, and re-appear in a few minutes. These are the fossorial wasps, the interesting habits of which have been studied by Mr. J. H. Fabre, of Avignon. They are not gregarious, but lead solitary lives and differ in their habits from their congeners. Bees feed their larvæ with honey and pollen which they take to them during the whole period of their development. Wasps are carnivorous, predatory insects, and bring their spoils to their brood of soft and feeble larvæ which are unable to provide for themselves. Bees and most wasps look after the welfare of their young ones in the fashion of human parents in nurseries.

Fossorial wasps act differently; they never see their young. They lay their eggs in burrows, sunk in the soil and hermetically sealed. The larvæ are hatched underground and are never seen by the mother. Provision sufficient for their development, however, is made in advance. Before depositing eggs, the females sink the burrows, and fill them with the spoils of the chase, which consist sometimes of spiders and sometimes of crickets or other insects. Each species of fossorial wasps preys on a particular kind of insect or on its allies, for the purpose of provisioning the burrows. These wasps are most fastidious in the choice of their food, and behave like collectors whose interest is only in a single or a few species of small animals. Léon Dufour, the well-known entomologist, was much struck by the ability displayed by certain wasps

(*Cerceris*, Fig. 3) in seeking out and capturing the pretty beetles of the genus *Buprestis*, which he had great difficulty in finding himself. In making a study of these beetles he collected the material from the burrows of *Cerceris*, and so avoided the laborious task of obtaining them in the natural state of freedom. The burrows were filled with motionless, but perfectly well preserved, *Buprestes*. Although dead Coleoptera dried up in a short time, those recovered from the burrows remained in a good state of preservation for weeks. Léon Dufour came to the conclusion that the *Cerceris* kill their prey, but inject into them some antiseptic liquid which perfectly preserves their flesh and intestines.

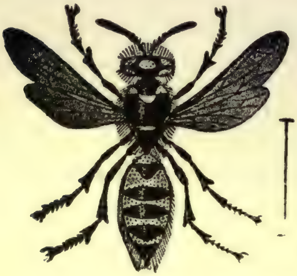

FIG. 3.—*Cerceris* (after Buffon).

J. H. Fabre pursued the study of the habits of fossorial wasps further. He ascertained that the captured insects were not dead, but only paralysed. The continuance of the function of certain organs demonstrated that the *Buprestes*, the weevils and other small creatures collected in the burrows of fossorial wasps, were alive. They could even perform some slight movements, but they were incapable of locomotion, and so could not escape. The mechanism of this paralysis, as far as could be ascertained by Fabre, is one of the most remarkable phenomena in nature. The fossorial wasps, guided by their instinct, immediately after having seized an insect or spider, bury their sting in the nervous centre which controls the movements of the legs. When animals with soft bodies, such as spiders and young crickets, are attacked, the operation does not present any difficulties. But Coleoptera in general, and the *Buprestes* and weevils in particular, are furnished with a very hard covering which cannot be perforated by the small and slender sting of a fossorial wasp. To gain their object the wasps probe exactly between the first and second pair of legs in the median line of the under surface of the thorax. The skin is thinner at this spot, and they introduce their sting into the ganglia from which arise the nerves of the legs. In the case with the *Buprestes* these ganglia are set close to one another, and a single prick suffices to affect the nervous centres of three pairs of legs. Once the sting has been inserted in this way the *Buprestis* becomes paralysed, but lives for many days. "The *Cerceris* which preys on Coleoptera," writes Fabre,* "appears to have made its choice according to the dictates of an exact physiology and anatomy. It is impossible to see in its proceedings the results of happy chance; more than chance is required to explain adaptations so precise."

After having filled the burrow with a sufficient quantity of insects or spiders, fossorial wasps lay their eggs and carefully close up the entrance. In due course the larva is hatched, and devours the food that it finds close at hand. If the gathered insects were not paralysed, they could easily escape from their prison; if they were dead, putrefaction or desiccation (according to circumstances) would render them unfit for the larvæ. It is therefore sheer necessity that is the factor in the development of this marvellous instinct that induces the fossorial wasps to attack the nervous centres of their prey. When one insect has been devoured, the larva proceeds to another, and so on, until it is fully grown, whereupon it envelops itself in a case that protects it during the winter and following spring. In summer it changes at first into a chrysalis, and later into a perfect insect. It frees itself from the cocoon, takes to flight, and enters upon life like that of its mother, which it has never seen.

---

* Fabre, "Souvenirs entomologiques," vol. I., pp. 71–78, Paris, 1879.

Of the harmonious phenomena in nature it is indeed difficult to find other examples so perfect as those of the habits of these fossorial wasps, or of the mechanism for the fertilisation of orchids. These harmonies in nature are constantly met with in the world of living beings, and it is not astonishing that they have for a long time attracted the attention of many observers and philosophers. As it seemed impossible to attribute them to the organisms themselves, because of the low rank and lack of intelligence of these, it has seemed only natural to set them down as a manifestation of a superior force which organises and directs all natural phenomena. This argument, however, omits one side of the medal.

Any close investigation of organisation and life reveals that, beside many most perfect harmonies, there are facts which prove the existence of incomplete harmony or even absolute disharmony. The examination of the flowers of orchids would lead one to the belief that each part, even the smallest and apparently most insignificant, has its *rôle* in the mechanism for fertilisation and cross-fertilisation. In reality it is not so. There are in certain orchids organs which do not fulfil any function.

Even among the species of *Catasetum*, in which the pollinia are thrown with force on the bodies of insects, there are some female flowers in which the male organs are rudimentary and without utility. In these flowers, according to Darwin,* "the two membranous sacks containing the rudimentary pollen-masses never open, but they easily separate from each other and from the anther. The tissue of which they are formed is thick and pulpy. Like most rudimentary parts, the pollen-masses vary much in size and form; they are only about one-tenth of the bulk of those of the male." There are then, without doubt, some structures that are of no service.

---

* *Loc. cit.* p. 201.

The existence of these rudimentary pollinia, incapable of being transported or of fertilising the female element, is easily explained by the supposition that formerly the flowers of the *Catasetum* were true hermaphrodites, but that in the course of time the male organs have become incompletely atrophied in certain flowers, in which, on the other hand, the female part has increased. The occurrence of an actual degeneration is shown by the existence of rudiments of the pollinia too insignificant to accomplish their normal functions.

Rudimentary and useless organs are widely distributed, and we find them in many places. Familiar instances are the atrophied eyes of animals that live in the dark, and the sometimes rudimentary sexual organs of many plants and animals.

Not only are orchids and other flowers adapted to fertilisation by means of insects, but many insects display special adaptations to their habit of visiting flowers. Butterflies, bees, and many other insects, possess mouth organs modified for the purpose of penetrating flowers to secure nectar or pollen. Other insects, again, are not so fortunate in this respect. Darwin * on one occasion "found an extremely minute Hymenopterous insect vainly struggling to escape, with its head cemented by the hardened viscid matter to the crest of the rostellum and to the tips of the pollinia (of an orchid, *Listera ovata*, Fig. 4). The insect was not so large as one of the pollinia, and after causing the explosion had not strength enough to remove them; it was punished for attempting a work beyond its strength, and perished miserably."

---

* *Loc. cit.* pp. 120–121.

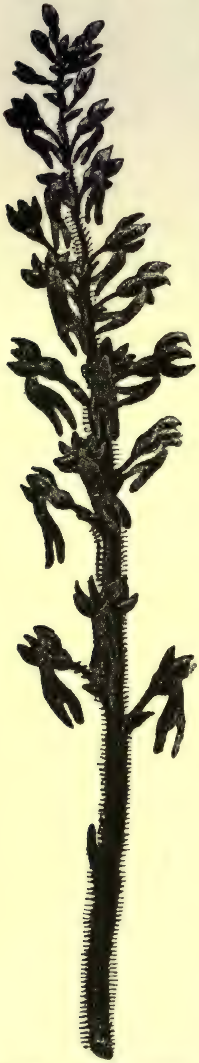

Fig. 4.—*Listera ovata* (after Barla, "Flora of Nice," 1868).

Many insects, well adapted for the purpose, delight themselves by sucking the nectar of flowers. Many others would wish to do the same, but their want of adaptation baffles them. A small "lady-bird" loves the sweet juice of flowers; it tries often to suck the nectar of the dandelion, but without success. Hermann Müller * has described the behaviour of this insect in procuring the nectar of *Erodium cicutorium*. "The awkward way in which this beetle, unadapted to feed on the plants, endeavours to obtain the honey, is too ludicrous not to be mentioned. After taking up a position on the petal, it puts its mouth in the direction of one of the honey-cups which are situated on both sides of the base of the petal. The petal soon breaks off, upon which the insect fixes itself on a neighbouring sepal or falls to the ground with the petal. In the first case it proceeds to creep over the flower and ends by detaching all the petals; in the other case, on recovering from the shock, it quickly ascends another stem of the same plant and begins again. I have seen the same lady-bird fall four times in succession with petals which it had detached without gaining wisdom."

---

* "Die Befruchtung der Blumen durch Insekten," p. 167, 1873.

The instincts of insects, well developed for certain functions, often present aberrations more or less whimsical and remarkable. The caterpillars of some butterflies, before changing into chrysalids, envelop themselves in a well-woven cocoon capable of protecting them from noxious influences. Protected by this covering, the caterpillar changes into a chrysalid, and later into a butterfly, which perforates the end of the cocoon in order to emerge. When any external agency destroys the cocoon, normal metamorphosis becomes impossible, and the larva dies before its maturity. Fabre * questioned whether the caterpillar during the time of the weaving of the cocoon was capable of repairing it if it was damaged. For this object he cut with a pair of scissors the end of a cocoon in the course of construction by the caterpillar of the beautiful peacock-butterfly. In spite of the hole thus produced, the caterpillar continued its ordinary work without suspicion that it would be of no avail. On this occasion "the caterpillar of the peacock-butterfly, notwithstanding the certain fate of the future butterfly, continued peaceably to spin, without in the least modifying the regular progress of its labour; when the time had arrived for the putting in of the last defensive stitches it placed them in the perilous breach, but neglected to mend the destroyed part of the barricade. It performed its vain task, ignoring what was indispensable for success."

Even amongst fossorial wasps, the instincts of which are so admirably developed, harmony is far from perfect. Fabre endeavoured to ascertain what effect was produced on these insects by taking away the egg laid in the burrow. He

---

* "Souvenirs entomologiques," Fourth series, Paris, 1847.

chose for this experiment the fossorial wasp *Pelopæus* (Fig. 5), which preys on spiders. He took away the egg which had been deposited in a carefully-prepared burrow, and watched the subsequent manœuvres. "The *Pelopæus* continued to store up spiders for the stolen egg; it gathered provisions that were not to be eaten; it redoubled its efforts to replenish a larder that I was constantly robbing with my forceps." The insect neither discontinued its fruitless task nor appeared to be aware of its fruitlessness. Here, then, is an example of a foiled maternal instinct that gained no useful end.

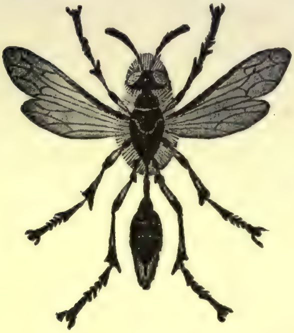

FIG. 5.—*Pelopæus* (after Buffon).

In connection with such a slaughter for the benefit of a progeny that will never exist, I may mention observations relating to a quite different order of phenomena. There are many creatures that kill and devour their progeny. Not infrequently rabbits kill and devour all their progeny, or leave them to die without food or care. Sometimes the culprits are young rabbits without experience; but this aberration of instinct is also met with in old rabbits, which once and for all have contracted the habit of abandoning or eating their young. Some females of other species of mammals and of birds have often been surprised in the act of deserting or of killing their offspring.

Perversion of sexual instinct is frequent enough amongst animals. Huber * states that when male ants have a lack of females they ravish the workers, the attacks being fatal, as the sexual organs are incompletely developed and functionally incapable. Abnormal pairing has also been observed in the stag-beetle of the genus *Lucanus*, in bees, and, above all, in cockchafers.* Higher animals, such as dogs, furnish analogous examples of sexual perversion.

---

* "Recherches sur les Mœurs des Fourmis indigènes," Paris, 1810.

Onanism is well known amongst mammals. It is frequent among monkeys in menageries, and also in rutting stags, the latter discharging the seminal fluid by friction with trees. Stallions and mares have often been observed in the act of satisfying their sexual appetites by abnormal means. There are several other species (dogs, bears, chamois, elephants, parrakeets, etc.,) which resort to onanism.†

These disharmonious instincts do not in the least cause the death of the animals that manifest them. But there exist in nature instinctive aberrations much more dangerous. Who has not seen in the summer numerous insects gathered round lamps and candles, attracted by the light? Among these are Coleoptera, Neuroptera (*Phryganea*), Ephemera, and, most frequently of all, small nocturnal Lepidoptera. After flying round and round the light several times, they singe their wings and die in numbers. This instinct is so constant and so developed amongst many of these insects, that it has been used against them for their own destruction. Thus amongst the means advocated for destroying a moth, *Botys sticticalis*, the caterpillars of which devour cereals and beetroot,‡ is the lighting of numerous fires in the fields. The moths, attracted by the light, fall in the flames and die in quantities.

When the usual swarms of may-flies emerge from the water, fishers make straw fires on their boats, and the insects singe their wings. The innumerable bodies incapable of flight fall into the water, and provide a coveted food for the fish.* This disharmonious and fatal instinct is displayed chiefly by nocturnal insects that rest during the day and do not leave their retreats till after sunset. In the cornfields Coleoptera of the genera *Anisoplia* and *Rhizotrogus*, resembling each other in form and general appearance, are to be found. When a fire is lighted in the darkness of the night it is only the *Rhizotrogus* that approaches it at the risk of its life. The *Anisoplia* remains quiet in the midst of the corn. The latter kind of beetle pairs during the day, while the *Rhizotrogi* satisfy their sexual desires during the night. Moreover, it is the males only of this species that fly about in the darkness and approach the fire, whilst the females rest at home in the plants.† It is probable, therefore, that light induces a sort of sexual excitement in these male beetles. The males, searching for the female, believe her to be in the midst of the flames, towards which they fly without being conscious of the danger they incur.

---

* Féré, "L'Instinct sexuel," Second Edition, p. 76, Paris, 1902.

† Moll, "Untersuch. üb. d. Libido sexualis," vol. II. pp. 372, 373.

‡ Kœppen, "Insectes invisibles," vol. II. p. 237, 1883. (In Russian.)

Such an interpretation of this disharmonious and suicidal instinct is confirmed by the fact that the moths attracted by fire are also almost exclusively males. Moreover, entomologists have advised against the lighting of fires by agriculturists in the belief that they destroy the noxious *Botys*, as they maintain that the females are not attracted. These latter therefore live on, and, being capable of laying eggs, produce a generation of voracious caterpillars.

Of the *Ephemera* attracted by fire in such great quantities males are by far the more numerous. It is therefore really very probable that the mad excitement which leads to the destruction of so many male insects, represents a sort of sexual aberration. In this connection it is to be remembered that, amongst Coleoptera, species exist of which the females, hidden in the grass, produce intense light which attracts the males. In the common glow-worm, the female, which is devoid of wings, alone shines with the familiar greenish glitter. Even in species of which the two sexes are luminous, the female shines more vividly. It is true that there are some beetles with luminous larvæ, a fact that led Darwin * to remark that the production of light by insects may serve to frighten enemies. This is possible, and it is also possible that certain insects make use of their luminosity to light their way in the darkness.† But, notwithstanding this, the sexual character of the luminous organ is so manifest in certain species that it is impossible to doubt its function as a means of attracting the male.

---

* Swammerdam, "Biblia Naturæ," Leydae, 1737.

† Brehm, "Les Insectes," édit. franç., vol. I., p. 206.

In conclusion I may say that it is not my purpose at present to discuss the meaning of an instinct so fatal to insect-life. I wish only to point out the frequency of the natural occurrence of disharmony, so that the satisfaction an instinct is fatal to so many of its possessors.

It is plain that an instinct, or any other form of disharmony leading to destruction, cannot increase, or even endure very long. The perversion of the maternal instinct tending to abandonment of the young is destructive to the stock. In consequence, individuals affected by it do not have the opportunity of transmitting the perversion. If all rabbits, or a majority of them, left their young to die through neglect, it is evident that the species would soon die out.

---

* "Descent of Man and Selection in Relation to Sex," vol. I., chap. 10, p. 345.

† R. Dubois, "Les Elatérides lumineux," p. 209, Meulan, 1886.

On the contrary, mothers, guided by their instinct to nourish and foster their offspring, will produce a vigorous generation capable of transmitting the healthy maternal instinct so essential for the preservation of the species. For such a reason harmonious characters are more abundant in nature than injurious peculiarities. The latter, because they are injurious to the individual and to the species, cannot perpetuate themselves indefinitely.

In this way there comes about a constant selection of characters. The useful qualities are handed down and preserved, while noxious characters perish and so disappear. Although disharmonies tend to the destruction of a species, they may themselves disappear without having destroyed the race in which they occur.

This continuous process of natural selection, which offers so good an explanation of the transmutation and origin of species by means of preservation of useful and destruction of harmful characters, was discovered by Darwin and Wallace, and was established by the splendid researches of the former of these.

Long before the appearance of man on the face of the earth, there were some happy beings well adapted to their environment, and some unhappy creatures that followed disharmonious instincts so as to imperil or to destroy their lives. Were such creatures capable of reflection and communication, plainly the fortunate among them, such as orchids and fossorial wasps, would be on the side of the optimists; they would declare this the best of all possible worlds, and insist that, to secure happiness it is necessary only to follow natural instincts. On the other hand, the disharmonious creatures, those ill adapted to the conditions of life, would be pessimistic philosophers. Consider the case of the lady-bird, driven by hunger and with a preference for honey, which searches for it on flowers and meets only with failure, or of insects driven by their instincts into the flames, only to lose their wings and their lives; such creatures, plainly, would express as their idea of the world that it was fashioned abominably, and that existence was a mistake.

As for man, the creature most interesting to us, in what category does he fall? Is he a being whose nature is in harmony with the conditions in which he has to live, or is he out of harmony with his environment? A critical examination is needed to answer these questions, and to such an examination the pages to follow are devoted.

CHAPTER III

SIMIAN ORIGIN OF MAN

Relationship of the human species with anthropoid apes—Analogies in the dentition, in the organisation of the limbs and of the brain—Resemblance of the vermiform appendage of man and anthropoids—Analogy between the placenta and fœtus of man and anthropoid apes—Blood relationship of man and monkeys shown by serums and precipitates—Transmutation of species—Sudden transition from monkey to man—J. Inaudi, the calculator, as an example of the sudden appearance of characters in the human species—Rudimentary organs in man—Proportion of progressive and retrogressive organs in the organisation of man

To understand human nature it is necessary first to give an account of the origin of man. This question has preoccupied mankind for ages, and for a long time it was believed that a solution of the problem was to be found in religious dogmas. Man was regarded as being of supernatural origin, the result of a special creation. Scientific criticism has now shown that there are no grounds for such a conclusion.

Nearly half a century ago Darwin applied to man his discovery of the principle of natural selection, and of the part played by that in the origin and transmutation of species. Soon after the publication of the "Origin of Species," attention was given to the special case of man.

In 1863 Huxley * gave an admirable review of the problem in his work on "Man's Place in Nature." He brought forward arguments of the highest scientific validity in support of the thesis that man is descended from animals, and that he is a mammal most nearly related to monkeys, and among these to the anthropoid apes. In spite of this masterly exposition, there are still persons of high intelligence and superior education who declare that science has not yet answered the question as to whence he came, and that the theory of evolution will never provide an answer.† Close examination of the structure of man has proved, in the most definite fashion, the existence of a near kinship with the higher monkeys, or anthropoids. When the chimpanzee and the ourang-outang were discovered, comparison became inevitable, and many naturalists, including the great Linnæus, saw that the human race must find its place in classification near the anthropoids.

Now that all the details of the human organisation have been studied, and the anatomical structures of man and large monkeys without tails have been compared, bone with bone and muscle with muscle, a truly astonishing analogy between these organisms is made manifest, an analogy apparent in every detail. It is known that in the natural history of mammals the teeth play an important part as a means of determining differences and relationships. The dentition of man bears a very great resemblance to that of anthropoids. Every one knows the *milk teeth* and the *permanent teeth* of man. The anthropoid apes bear in this respect an astonishing likeness to man. The number (thirty-two in the adult), the form and general arrangement of the crown, are identical in man and anthropoid apes. The differences are to be found only in minor details, such as the exact shape and relative dimensions and the number of cusps. It can be said in a general way that in the anthropoid apes the teeth are more strongly developed than in man. The canines are much longer and the roots of the pre-molars are more complex in the gorilla than in man.

---

* Republished, with other essays, as "Man's Place in Nature," Macmillan, London, 1894.

† Brunetière, *Revue des Deux Mondes,* Jan. 1, 1895, p. 99.

But the fact must not be lost sight of, that all these differences are less pronounced than those which exist between the dentition of anthropoid apes and that of all other monkeys. Even in the cynocephalous monkeys, those that most nearly approach the anthropoids, the teeth exhibit marked differences. Thus, the forms of the upper molars are quite different in the baboon and in the gorilla. The canines are longer, and the pre-molars and molars are still more complex in the baboon.

In the monkeys of the New World, the dentition differs still more from that of man and anthropoids. Instead of thirty-two teeth, they possess thirty-six in the adult condition. The number of pre-molars is twelve instead of eight. The general form and the crowns of the molars are very different from those of anthropoid apes.

These considerations led Huxley to conclude that "it is obvious that, greatly as the dentition of the highest ape differs from that of man, it differs far more widely from that of the lower and lowest apes." *

Another character which shows that anthropoids are nearer man than other monkeys is furnished by the anatomy of the sacrum. In monkeys as a whole the sacrum is composed of three, or rarely four, vertebræ, while in anthropoid apes it contains five, that is to say just as many as in man.

---

* *Loc. cit.* p. 116.

The whole skeleton, and particularly the skull of man, and the higher monkeys, present certainly some marked differences; but here again the differences are less than those between the anthropoid apes and other monkeys. As regards the osteology the proposition laid down by Huxley is just. "So that, for the skull, no less than for the skeleton in general, the proposition holds good, that the differences between man and the gorilla are of smaller value than those between the gorilla and some other apes." *

The believers in the doctrine that the human species is essentially distinct from all the known monkeys have laid great stress on the difference between the foot of man and that of anthropoid apes. This difference cannot be denied. Man assumes the direct posture habitually, while monkeys, even the highest of them, walk on two legs only occasionally. There has followed from this a greater development of the feet in monkeys. Yet this difference ought not to be exaggerated. It has been sought to prove that monkeys are "quadrumanous," and that their hind legs terminate in "hind-hands." But it is clearly shown that in all essential respects the hinder limb of the gorilla terminates in as true a foot as that of man.† "The hind limb of the gorilla, therefore, ends in a true foot, with a very movable great toe. It is a prehensile foot, indeed, but is in no sense a hand; it is a foot which differs from that of man not in any fundamental character, but in mere proportions, in the degree of mobility, and in the secondary arrangement of its parts." ‡

In all these cases the argument is confirmed, "that be the differences between the hand and foot of man and those of the gorilla what they may, the differences between

---

* *Loc. cit.* p. 111.

† *Loc. cit.* p. 126.

‡ *Loc. cit.* p. 126.

those of the gorilla and those of the lower apes are much greater."*

The comparison of muscles and of other internal organs leads to the same conclusion; the differences between monkeys are more varied and greater than those between anthropoids and man. The anatomy of the brain has been much discussed with regard to this. Several distinguished zoologists, amongst them Owen in particular, have insisted on the absence in all monkeys of certain parts of the brain peculiarly characteristic of man. Such are the posterior lobe, the posterior cornu, and the lesser hippocampus. Controversy on this topic has been animated; but, ultimately, the opinion of Owen did not triumph, and now it is unanimously accepted that the parts of the brain in question are "precisely those structures which are the most marked cerebral characters common to man with the apes. They are among the most distinctly simian peculiarities which the human organism exhibits." †

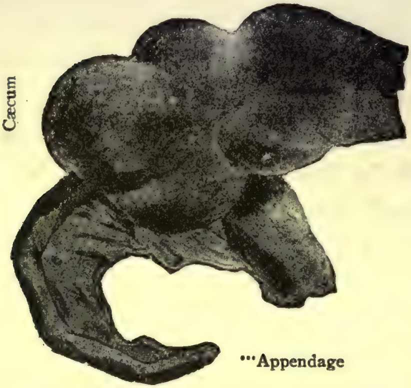

FIG. 6.—Cæcum and vermiform appendage of man (after Ewald).

As regards the brain, the differences between man and anthropoid apes are certainly less marked than those that exist between the higher and lower monkeys.

The digestive tract affords another argument in favour of the affinity of anthropoid apes to man. The human cæcum is furnished with the very remarkable and strange vermiform appendage which often is the cause of a grave and prevalent illness known as *appendicitis*. Now, it is quite remarkable that this organ is practically identical with the vermiform appendage of anthropoid apes. A glance at the accompanying figures (6 and 7) will convince the reader of this. Yet none of the other monkeys present any such resemblance with man.

---

* *Loc. cit.* p. 127.

† *Loc. cit.* p. 139.

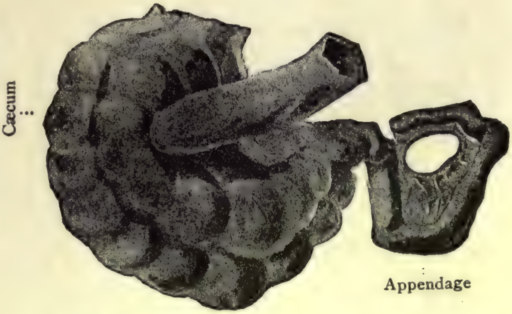

FIG. 7.—Cæcum and vermiform appendage of the chimpanzee (from a preparation in the Paris Museum of Natural History).

It is not surprising, in the face of resemblances so numerous, that forty years' science has proclaimed the existence of a close affinity between man and the anthropoid apes. The view has become an established doctrine, now that no single fact has been brought against it. Since the theory was enunciated we have learned much regarding the natural history of these apes. Generally, when a theory is false, a new set of facts overthrows it. Attempts may be made to trim the new facts to the existing theory, but such attempts are doomed to failure, and the theory disappears. It is of special interest, then, to confront the simian theory of the origin of man with a series of facts gathered by science since the theory was propounded.

When Huxley wrote, the embryological history of anthropoid apes was practically unknown. Darwin, Vogt, and Haeckel, in their attempts to support the theory of the animal origin of man, had not sufficient knowledge of the embryology of monkeys. It is only recently that important work on this subject has been published.

It is known that the history of development is very often an excellent guide in tracing the relationship of organisms.

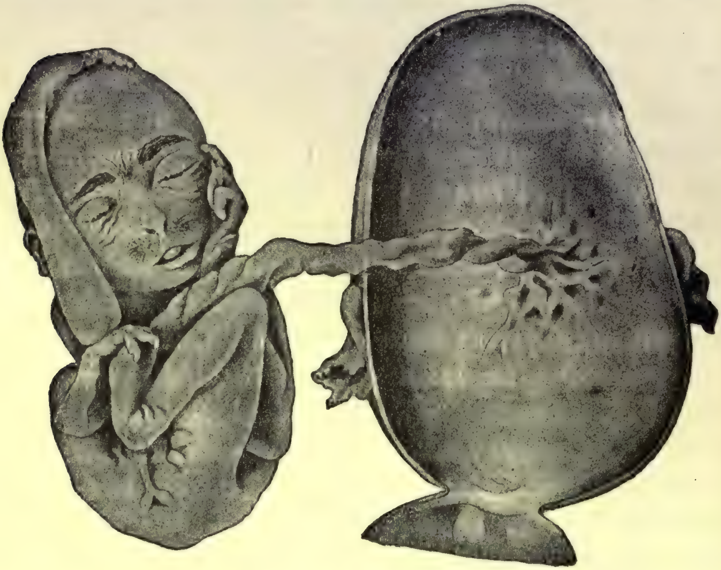

FIG. 8.—Fœtus of gibbon (after Selenka).

It is therefore interesting to examine the established facts concerning the embryology of anthropoid apes. The material for these studies is very difficult to obtain, and it is not astonishing that even our present state of knowledge is still imperfect.

The placenta often gives information of great importance in the classification of mammals. It is sufficient to glance at the zonary placenta of dogs and seals to be convinced of the relationship of these two species, which at first sight seem so different. Now, the placentas of all the anthropoid apes examined up to the present are of the same discoid type as that of man. The arrangement of the umbilical cord of man, which was formerly considered as quite peculiar to him, is found in anthropoid apes, as has been established by Deniker * and Selenka.† It is striking that the anthropoids resemble man rather than the lower monkeys in the relation of the fœtus to the fœtal membranes.

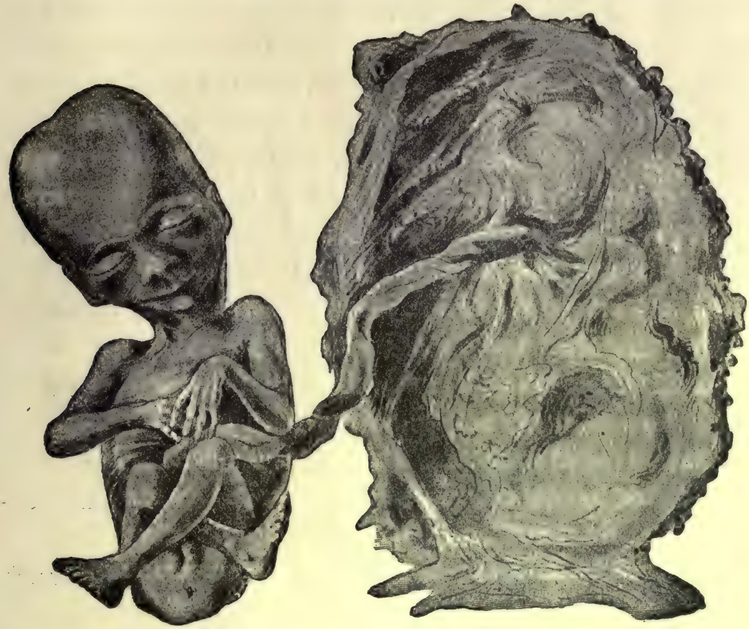

FIG. 9.—Human fœtus of three months and a half.

With regard to the embryos themselves, the similarity between those of monkeys and of man is very great. Selenka insists on the fact that the youngest stages of human development that have been obtained can hardly be distinguished from those of the lower monkeys either in position or in shape. More advanced stages exhibit greater differentiation, and the later embryos of man resemble those of

---

* "Archives de Zoologie expérimentale," 1885.

† "Studien über Entwickelungsgeschichte der Thiere," 1898–1902.

anthropoids much more closely than those of the lower monkeys. The fœtus of the gibbon, figured by Selenka (Fig. 8), presents the most striking likeness to a corresponding human fœtus (Fig. 9).

Later on, the characters that distinguish man from even the highest of the apes become more and more pronounced. In the anthropoids the facial portion becomes more and more prominent, and betrays a bestiality absent from the human form. None the less the resemblance between the nearly mature fœtus of anthropoids and human embryos of about the sixth month is evident enough. M. Deniker had the good fortune to obtain the late fœtus of a gorilla—a very rare piece of fortune—and he has made an elaborate investigation of its structure. The general appearance (Fig. 10) is quite enough to show the close relationship with a human fœtus of a corresponding age (Fig. 11). It is plain, moreover, that the young gorilla is more human-like than is the adult. Detailed anatomical investigation only confirms this conclusion.

The skulls of the young stages of anthropoids are much more human in their character than the adult skulls. Selenka states that such young skulls of different anthropoids not only resemble one another more closely, but are more human. As soon as the teeth begin to appear, the individual characters are assumed so rapidly, and become so marked, that, in the absence of the intermediate stages, it would be difficult to establish the kinships.

The data derived from embryology do not point to any one of the existing genera of monkeys as the ancestor of man. They lead us to infer, rather, that man and the anthropoid apes had a common origin, and palæontological evidence must be scanned to find this ancestor. The greatest importance has been attached to a discovery in Java, made in 1894 by Eugène Dubois. The remains, consisting of the crown of a skull, two teeth and a femur, belonging to a creature for which the name *Pithecanthropus erectus* * has been invented, have been interpreted by several anatomists as those of a form intermediate between man and the anthropoid apes. However, as the facts about this creature are meagre and have been interpreted differently, I shall not make use of them in my argument. Even apart from them, the simian origin of man may be taken as proved.

The series of facts that I have been employing as evidence of the relationship between men and anthropoid apes has been drawn from the observations of anatomists and embryologists. Darwin, seeking to broaden the basis of the argument, called attention to the resemblances of the parasites of men and apes, as evidence of a close similarity of physiological processes in the creatures. In the last few years, investigations in a very different field seem capable of throwing a novel light on the question.

When the blood of one mammal is injected into the body of another, the latter shows remarkable modifications. When there is added to a serum, prepared from the blood of a rabbit and consisting of a colourless transparent liquid, a few drops of blood drawn from another rodent (for instance a guinea-pig), nothing unusual happens. The blood of the guinea-pig preserves its normal colour, and its corpuscles remain practically unaltered. If, instead of adding guinea-pig's blood to the serum of rabbit's blood, we add a serum drawn from the blood of the guinea-pig, still no special change occurs.

If, however, a serum be prepared from the blood of a rabbit into which there had first been injected the blood of a guinea-pig, the serum shows new and striking qualities. The addition to it of some drops of guinea-pig's blood

---

* A summary of this question is to be found in a new volume by M. Alsberg, "Die Abstammung des Menschen," chap. iii., 1902.

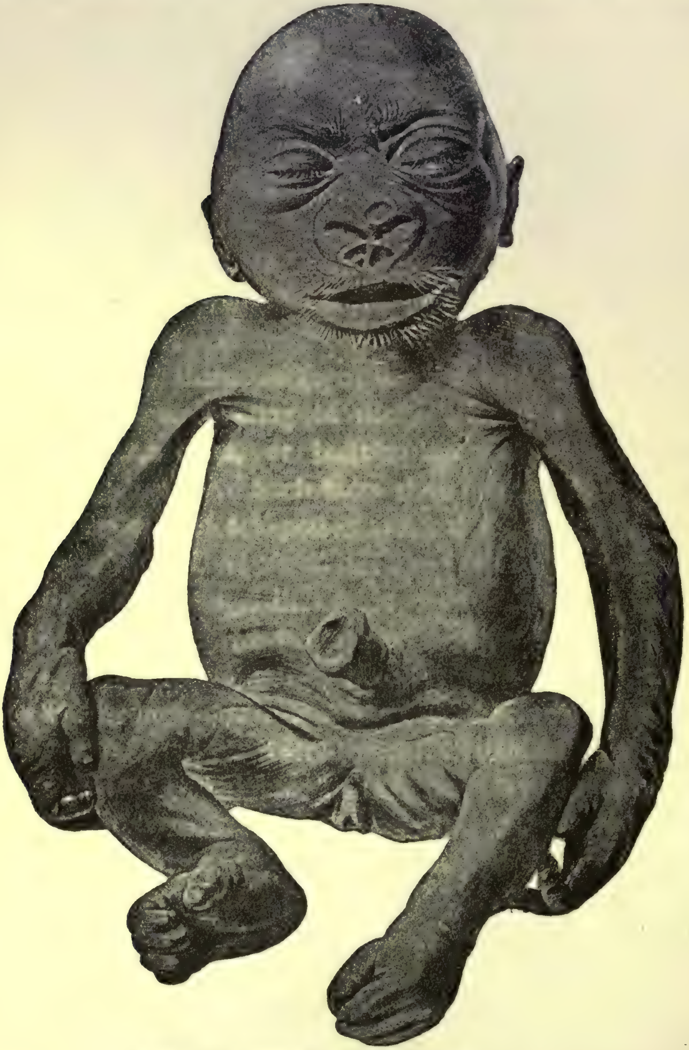

FIG. 10.—Fœtus of gorilla (after Deniker).

brings about, in a very short time, a changed appearance. The red liquid, at first opaque, becomes transparent. The mixture of the prepared serum of the rabbit with the blood of the guinea-pig will assume the colour of claret mixed with water. The change is due to solution of the red corpuscles of the guinea-pig in the blood-serum of the rabbit.

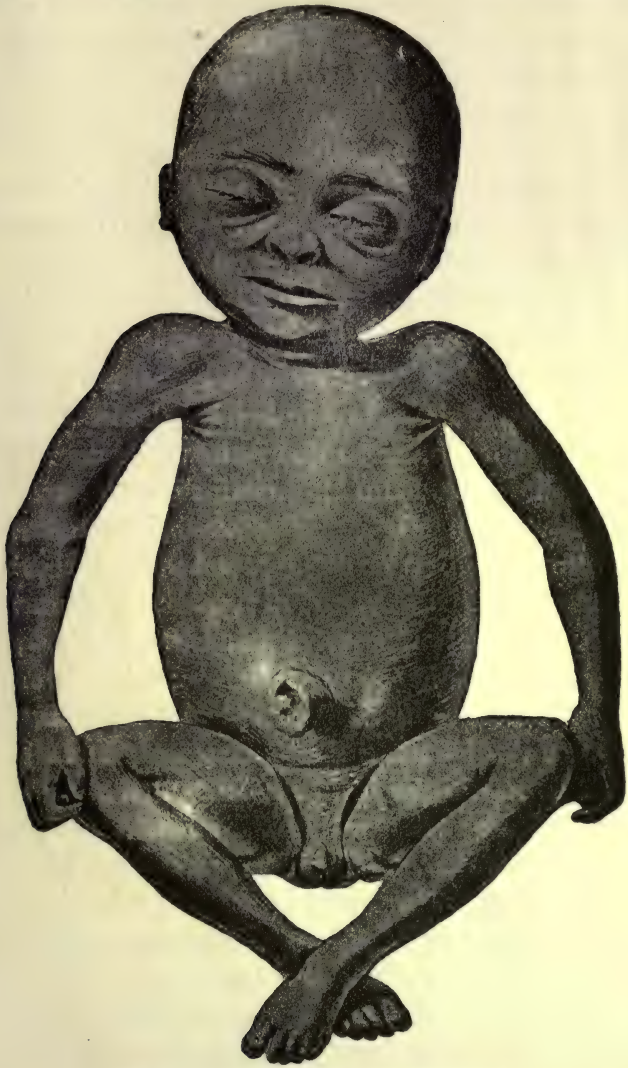

FIG. 11.—Human fœtus of about five months.

This serum has still another property not less worthy of attention. If there is added to it not pure blood but only blood serum of the guinea-pig, a disturbance in the mixture occurs almost at once, and leads to the forming of a precipitate more or less abundant.

The injection of the blood of the guinea-pig into a rabbit has therefore changed the serum of the latter by introducing new properties: that of dissolving the red corpuscles of the guinea-pig and of giving a precipitate with the blood serum of the same animal.

Frequently the blood serum of animals prepared by previous injections of the blood of other species of animals is strictly specific. In such cases the serum only gives a precipitate with the serum of the species which has furnished the blood for the injections, and only dissolves the red corpuscles of this same species. But there are some instances in which a serum of a prepared animal dissolves, not only the red corpuscles of the species which has furnished the injected blood, but those of allied species. Thus the blood serum of the rabbit, after some injections of blood of the chicken, becomes capable of dissolving not only the red corpuscles of the chicken but also those of the pigeon. although in a less degree.

It has been suggested that assistance could be rendered to forensic medicine by making use of this property of serums, to discover the origin of a certain blood. As is well known, it is often very important to decide whether a stain was caused by the blood of man or of another animal. Until quite recently it was not known how to distinguish human blood from that of other mammals. Experiments have been made to discover if the red corpuscles found in the blood stain could be dissolved by the serum of animals which had previously been injected with the blood of man.

In a certain case the human origin of the stain in question was shown. But it was soon discovered that this method was not infallible. It is now found that the method of precipitates gives much more conclusive results. It is done in this way: Human blood is injected several times into any animal (rabbit, dog, sheep, horse). Some time afterwards the animal is bled, and a clear and limpid serum, quite devoid of corpuscles, is prepared. When there is added to this serum one or several drops of human serum, it forms immediately a precipitate which falls to the bottom. In this way it is discovered whether the prepared serum is sufficiently active. It then becomes possible to recognise even dried human blood. A little of such blood is dissolved in normal salt solution, and placed in a tube containing the serum of an animal prepared by means of the injections of human blood. If a precipitate forms in the liquid in a short time, the fact indicates that the stain is really human blood. This method is being practised in forensic medicine.

This reaction is of great interest to us because it is of assistance in revealing the relationship between species. The serum of an animal prepared with the blood of the fowl gives a precipitate, not only with the serum of the fowl itself, but also with that of the pigeon; on the other hand, it remains undisturbed when the serum of mammals is added. The reaction indicates then that there is a sufficiently marked degree of relationship between the fowl and the pigeon. Here is another example: the serum of an animal prepared with the blood of an ox gives an abundant precipitate when there is added to it a little blood serum of the ox, but it does not produce this reaction with the serum of any of the other mammals, not even with that of the sheep, stag and deer.* The relationship between the *Bovidæ* and these other ruminants is then not so close as that between the fowl and the pigeon.

---

* Uhlenhuth, "Deutsche Medecin. Wochenschrift," p. 82, 1901.

How does the serum of animals which has been injected with human blood behave? The serum capable of giving a precipitate with human serum does not produce the same reaction except with the serum of some monkeys (the small *Papio*).*

Gruenbaum, of Liverpool,† has been fortunate enough to procure a considerable quantity of the blood of three large anthropoid apes—the gorilla, chimpanzee, and ourang-outang. He has been able to prove that the serum of animals injected with man's blood gives a precipitate not only with this blood but also with that of the above-mentioned apes. It was impossible for him "to distinguish this precipitate as regards quality and quantity from that which is obtained with human blood."

To verify this result, Gruenbaum prepared the serum of animals injected with the blood of the gorilla, chimpanzee, and ourang-outang. These three kinds of serum gave precipitates with the blood of these three apes, and to the same extent with the blood of man. It is therefore evident that there exists between the human species and the anthropoid apes not only a superficial analogy of body and of the principal organs, but a close blood-relationship.

Facts of this kind could not be foreseen when the theory of the simian origin of man was put forward. In spite of this they have arisen to confirm it in a truly astonishing way.

It is therefore impossible to doubt that man is a member of the group of primates having a close connection with the higher monkeys of the present time. This result is of great importance in all questions relating to human nature.

---

* Wassermann and Schuetze, "Berliner klinische Wochenschrift," p. 7, 1901.

† The *Lancet*, Jan. 18, 1902.

It would certainly be of considerable interest to know more exactly what steps were followed in this simian descent of man. On this question our knowledge is still very imperfect. In his researches on anthropoid apes, Selenka insists on a more intimate relationship between the chimpanzee and man. "The great resemblance of the premolars and of the molars in the permanent dentition of the chimpanzee with human teeth appears to indicate that the chimpanzee and man have a common origin, and descend from extinct forms like *Dryopithecus*. This conclusion, however, is contradicted by the fact that the milk teeth of the chimpanzee are much nearer those of the ourang-outang than those of man." *

It is evident that to clear up this question it would be necessary to have a greater knowledge of fossil anthropoids such as *Dryopithecus* and its allies. In the present state of knowledge only a very general hypothesis can be formuated as to the exact mode of human descent.

We have already shown that the fœtus of man and of the anthropoid monkeys resemble each other much more than the adult forms, and that the young of these apes also bear a greater likeness to man than do the adults. The great development of the skull as compared with the face is characteristic of young monkeys and of man young or old. The jaws continue to develop in the anthropoids, while in man there occurs in this respect a certain arrest of development. The hairs, so small in man, also show a similar arrest. Generally they remain during the whole life in a state of incomplete development. It is especially on the back of man that this feeble development of hairs occurs.

---

* Selenka, *loc. cit.* p. 157.

As this part of the body in monkeys, on the contrary, is much more hairy than the under surface, it has been held to constitute an essential difference between man and monkeys. But embryological study enables us to settle this apparent contradiction. The fœtus of the gorilla examined by M. Deniker possessed an almost entirely smooth back. "The fœtus had true hairs only on the head, the anterior surface, and around the lips and the genital organs, and the eyelashes and eyebrows. The remainder of the body was smooth or covered with down not exceeding a millimetre in length." *

The skin of the under surface, smooth around the navel, was covered with small hairs more thickly than on the back. The abundance of hairs on the posterior aspect of the body of monkeys is a later acquisition, which develops but tardily during fœtal life.

As regards the distribution of these hairs man resembles much more the embryos of monkeys than adult monkeys. This fact, instead of shaking the theory of relationship between man and apes, gives us strong evidence as to the mode of his descent. Putting the known facts together, we may infer that man is a case of the arrested development of some simian of ancient days, as it were, a simian monster from the zoological point of view, although not from the æsthetic. Man may be regarded as a prodigy sprung from an ape, born with a larger brain and an intelligence more highly developed than occurred in his parents. Such a view is in accordance with known facts.

It must be admitted that certain kinds of organisms, instead of evolving at a very slow pace, spring up suddenly, and that in such a case nature proceeds with a considerable stride. Darwin foresaw this possibility, but it has been

---

* Deniker, *loc. cit.* p. 17.

made plain to us by the remarkable researches of the botanist Hugo de Vries.*

De Vries cultivated for fifteen years the Evening Primrose, a plant of American origin (*Œnotera lamarckiana*). He obtained, suddenly, a set of flowers quite distinct from those of the original plant. They presented such great differences that he could separate them as several quite distinct species. During the first few years de Vries obtained three species (*Œnotera lata*, *Œn. nanella*, and sometimes *Œn. scintillans*), but variation becoming more and more prevalent, he ultimately distinguished a dozen new species. These were grown from seed, and transmitted their specific characters to their descendants. De Vries, in this way, was a witness of the sudden appearance of new species.

It is probable that man owes his origin to a similar phenomenon. Some anthropoid ape having at a certain period become varied in specific characters, produced offspring endowed with new properties. The brain, of abnormal size, placed in a spacious cranium, allowed a rapid development of intellectual faculties much more advanced than those of the parent and those of the original species. This peculiarity would be transmitted to the descendants, and, as it was of very considerable advantage in the struggle for existence, the new race would hold its own, propagate and prevail. The extraordinary development of intelligence necessarily led to perfections in the choice of nourishment, perfections which approached the art of preparing more digestible food. The jaws, under these conditions, had not such a difficult task as before, and, moreover, they were no longer required for attack or defence. They became less developed than in the true anthropoid apes.

---

* "Die Mutationstheorie," vol. I., Leipzig, 1901.

These suggestions involve a conception of the mind that is in harmony with known facts. From time to time prodigies are born with some talent far greater than the gifts possessed by the parents.

About twelve years ago a young native of Piedmont, Jacques Inaudi by name, became famous in Paris on account of his extraordinary power of calculation. He had an astonishing memory for figures, and could perform mathematical calculations with surprising rapidity.* Two minutes were sufficient for him to multiply two numbers composed of seven and six figures. Other arithmetical calculations, such as the extraction of roots, gave him but little trouble.

To attain this result, Inaudi made use of his extraordinary memory for figures, founded on the persistence of auditory images. When he heard the numbers pronounced, he remembered them. Inaudi declared to the Commission convened by the Academy of Sciences, that when he tried to recall the numbers he heard them as if repeated aloud, in the tone of his own voice, and that he could hear them for the greater part of the day. "In an hour, or in two hours' time, if I thought of the number that was uttered, I should be able to repeat it as exactly as I have done before the Commission."

Now this very extraordinary and rare auditory memory was developed in an altogether abrupt way. Inaudi, the son of poor peasants of Piedmont, passed the first years of his life as a shepherd. At the age of six his wonderful faculty of calculating figures appeared. He did not know at this time how to read or to write. At eleven years of age he astonished the members of the Anthropological

---

* "Comptes Rendus de l'Académie des Sciences," 1892, pp. 275, 1329; "Revue scientifique," 1880, p. 1124.

Society of Paris by his phenomenal memory, and it was only much later, at the age of twenty, that he learnt to read and write. Neither of the parents of Inaudi had shown in the slightest degree a calculating faculty like that of little Jacques. It must then be admitted that it was developed as suddenly as the new qualities in the Evening Primrose that we have already mentioned.

The first men, also, were probably ingenious children, born of anthropoid parents. This hypothesis very well explains the fact that man is more like the fœtus and the young of anthropoid apes than the adult animals, and exhibits only a trace of many organs which are much more developed in simian species.

A very distinguished German anatomist, Wiedersheim,* has given in a pamphlet a *resumé* of our actual knowledge of the organs of man from the point of view of their descent. He has found fifteen organs which show in the human species a considerable advance on those of anthropoid apes. The chief of these are the lower limb, well adapted for a constant erect carriage of the body; the strengthening of the pelvis and of the sacrum, as well as the broadening of the more slender pelvis of the female; the curvature of the lumbar part of the vertebral column; the development of the buttocks and of the calves; the difference of certain muscles of the face; the nose; certain strands from the brain to the spinal cord; the occipital lobe of the brain; the greater development of the cerebral cortex, and, lastly, the considerable differentiation of the muscles of the larynx which permit speech.

But besides these progressive organs, Wiedersheim has counted seventeen decaying organs, still able to fulfil their physiological function in a more or less incomplete manner (amongst these are the decadent muscles of the leg and foot; the eleventh and twelfth pairs of ribs, the toes, the cæcum, etc.), and not less than one hundred and seven rudimentary organs which serve no useful physiological purpose (to this category belong the coccyx—the vestige of a tail—the thirteenth pair of ribs in the adult, the muscles of the ear, the vermiform appendage, etc.).

---

* "Der Bau des Menschen," Third Edition, 1902.

We have already shown in the preceding chapter the great importance of rudimentary organs as aids to the tracing of the genealogy of organisms. These organs, useless at present, are the vestiges of similar but more developed organs, which fulfilled a useful function in our ancestors.

The extraordinary quantity of rudimentary organs in man furnishes another proof of his animal origin, and puts at the disposal of science information of great value for the philosophic conception of human nature.

CHAPTER IV

DISHARMONIES IN THE ORGANISATION OF THE DIGESTIVE SYSTEM OF MAN

Perfection of the human form—The covering of hair—The dentition in general and the wisdom teeth—The vermiform appendage—Appendicitis and its gravity—Uselessness of the cæcum and of the large intestine—Instance of a woman without a large intestine—Ancestral history of this portion of the digestive tract—Injurious effect of the microbes of the large intestine—Frequency of cancer of the large intestine and of the stomach—Limited usefulness of the stomach—The instinct of choice of food—Futility of this instinct in man

ALTHOUGH he is a recent arrival on the earth, man has made great progress as compared with his ancestors, the anthropoid apes. A comparison between even the lower races of man, such as the Hottentots or the aborigines of Australia and higher types such as the inhabitants of Europe and of North Africa, shows that a very great advance has been made.

Human art has been able to surpass nature in many instances. No natural sound is so perfect as some of the more beautiful pieces of modern music. Even in the production of form, man has triumphed over nature. Breeders of flowers or of birds seek to produce new varieties. With this object they often frame a conception of what they desire to produce, and, so to speak, set about to realise their programme. They prepare ideal images to serve them as guides in the process of production. By the method of artificial selection they often succeed in their wishes, and add to their collections some remarkable form. In such fashions aviculture and horticulture have produced birds and flowers more beautiful than any found in nature.

In regard to the human body, attempts have been made to surpass nature and to represent a body corresponding to an artistic ideal. To arrive at something more beautiful than man, the wings of birds or the characters of some other creatures have been added to his presentment. Such attempts have had no other result than to show that the human form, as created by nature, cannot be surpassed. The ancient conception of the human body as the artistic ideal has been fully justified. The views of those religious fanatics who have thrown contempt on the body by representing it in degraded forms, must be rejected.

It is impossible, however, to apply this result to our conception of the nature of man in general. The beautiful form of the human body appears only in youth and in maturity. In old age, the bodies of men and women are generally ugly, and in extreme old age it is almost impossible to see the traces of former beauty.

Nor can conceptions of perfection drawn from the human face and body be extended to the whole of man's organisation. A glance at some of the organic systems will make this plain.

The human skin is covered with little hairs, the history of which is interesting. In one stage of embryonic life nearly the whole of the body is clad with hairs. This covering is known as the *lanugo*, and consists of strands of hair, disposed very regularly all over the body, save on the nose and the hands and feet. There is no doubt but that this is functionless, and is no more than an inheritance from the old ape-like condition. Later on, it falls out and is replaced by the ordinary downy covering of the body. In adult life, and particularly in old age, the hairs of the second coat tend to grow very long and so to form a covering that is neither beautiful nor in the least degree useful. We may take this as a first example of a disharmonious condition in the human body. Hairs, incapable of protecting the body from cold, survive merely as an ancestral relic and may become even harmful.

The human skin is constantly exposed to the microbes in dust; and the follicles of the hairs, in which these microbes lodge, form receptacles very favourable to their multiplication. In the hollows of the follicles, certain microbes, as for instance some of the *Staphylococci*, multiply rapidly and give rise to acne and to pimples. The process may even go the length of producing a chronic skin-disease very unpleasant and even dangerous if it be associated with suppuration.

In the human race, intelligence, that is to say, the activity of the brain, supplants many other functions, and man is able to protect himself against the inclemencies of weather much better than his furry ancestors were capable of doing. He is able to do this through his invention of clothing which may be varied with the nature of the weather. But the obstinate laws of inheritance burden him with a covering of hair, not only useless but frequently harmful. And this is only one example among many.

Although, in an extreme case, man is able to survive the total loss of the teeth, it cannot yet be said that teeth are useless or harmful. None the less, a study of the human dentition reveals that this set of organs is out of harmony with the fundamental needs of our race. The monkeys of the old world (*Catarrhines*), although they belong obviously to the brute creation, already exhibit a tendency to reduction in the number of teeth. While American monkeys (*Platyrrhines*) may possess thirty-six teeth, the old world forms do not possess more than thirty-two in all, at least as a normal occurrence. Selenka * has shown that among gorillas and ourangs individuals with a fourth pair of molars, bringing up the number of teeth to thirty-six, are not rare, He found these additional molars in 20 per cent. of one hundred and ninety-four adult skulls of ourangs. On the other hand, in the cases of the chimpanzee and the gibbon, the third pair of molars differ from the others in smaller size and occasional absence. This reduction is to be associated with the smaller jaws and less powerful mastication of these anthropoids.

Cases of supplementary molars are very rare in man, and occur more frequently in the lower races, such as negroes, Australians, and natives of New Caledonia.† On the other hand, absence of the third pair of molars, that is to say, of the wisdom teeth, is quite frequent, especially in the white races. Nearly 10 per cent. of Europeans throughout their lives have no more than twenty-eight teeth, the wisdom teeth being absent. This absence is more common in the upper jaw, where it occurs in from 18 to 19 per cent. of men. The loss of the wisdom teeth ‡ is on the whole to be regarded as an advantage. Certainly from the "physiological point of view the part played by the wisdom teeth is subordinate. Their power of masticating is feeble ; the loss does not appreciably interfere with mastication. The complete absence of all four has no influence on mastication." * These teeth are cut very late, often not appearing until the thirtieth year and sometimes being delayed to extreme old age.

---

* Selenka, "Studien über Entwicklungsgesch. d. Thiere," p. 89.

† "Dictionnaire encyclopédique des Sciences Medicales," article "Dent," by Magitot, p. 194, 1882.

‡ Schmid, "Vierteljahrschrift für Zahnheilkunde," p. 141, 1896.

Even if they were only useless, the wisdom teeth would furnish an instance of disharmony in the human body. But these teeth often are a source of trouble which, although it is not often serious, may lead to grave diseases and even to death. No other teeth are so subject to accident. This is due partly to the slowness with which they develop and to the difficulty they encounter in cutting the mucous membrane. Dental caries, moreover, is specially frequent in them.† The membrane surrounding them is specially subject to small lesions by which the infection spreads to adjacent parts. Inflammatory conditions frequently arise from these teeth, and tumours, caries of the jaw-bone and even diffused suppuration, leading to death, may be sequelæ of wounds of the wisdom teeth. Galippe ‡ has described a case in which one of these teeth, failing to cut the gum in the normal position, made its way through the cheek. This produced an inflammatory suppuration of the cheek with numerous fistulæ and an inflammation of the masseter muscle which made it impossible for the mouth to open. Notwithstanding the extraction of the wisdom tooth that had been the cause of all these troubles, the patient died of meningitis, which had started from the tooth. Other cases have been described in which a difficult eruption of the tooth led to formation of an abscess in the bone, from which there arose a fatal abscess of the brain.

Wisdom teeth may be the starting-point even of cancerous

---

* Schmid, *loc. cit.* p. 147.

† Redier, in "Revue mensuelle de Stomatologie," p. 164, 1895.

‡ "Comptes Rendus de la Société de Stomatologie de Paris," vol. I., p. 98, 1890.

tumours. Magitot * writes that very many neoplasms of the jaw may be traced to a source of origin in the socket of the wisdom tooth.

There is no useful function of these teeth to set against their disadvantages. It was our remote ancestors, masticating hard food, that had the advantages of these additional teeth. In man they are rudimentary organs, and provide another proof of our simian origin.

The cæcal or vermiform appendage is another rudimentary organ in the human body, and is interesting from many points of view. I have already referred to its importance as definite evidence of our origin from lower animals, and shown how striking is the resemblance of the human organ to that of the anthropoid apes. It consists of a thick wall, containing glands, a muscular layer and lymphoid clumps. That it performs no function useful to man is made clear by the existence of undisturbed health in persons from whom it has been removed. Thanks to the advances of modern surgery, this organ has been removed very often, and sometimes even in cases where it did not appear to have been diseased. In a great majority of the cases, the removal of the organ succeeded well, and the patients experienced no harm, but appeared to carry on all the processes of digestion with equal completeness.

On the other hand, the cæcal appendage in man is frequently obliterated, there being no trace of the normal aperture, so that there is no connection between it and the general digestive cavity. According to Ribbert,† nearly one person in four possesses the appendage in an obliterated condition, the condition being particularly frequent in the

---

* *Loc. cit.* p. 204.

† Virchow's "Archiv für Pathologische Anatomie," 1893, vol CXXXII., p. 76.

aged. In young persons and infants the aperture of the appendage is usually open. In cases where there is no communication with the cavity of the digestive tract, the processes of digestion appear to be normal. It is logical to conclude that in the human being the function of the cæcum is either absent or very slight.

Even in the anthropoid apes the appendage of the cæcum appears to be a rudimentary structure, with a function at most accessory to that of the lymphoid clumps. In lower old-world monkeys the vermiform appendage does not usually exist, cases such as that of *Cercopithecus sabaeus*, in which it is present as a little boss, being rare. It is necessary to seek the purpose of this structure still lower in the scale of life. In some herbivorous creatures the cæcum is large, and ends in a portion richly provided with lymphoid tissue, and similar to the vermiform appendage. The rabbit and certain marsupials are good examples. Undoubtedly, in their cases, the portion of the digestive canal which corresponds to the vermiform appendage of man is active in the digestion of vegetable matter. The organ is a very old part of the constitution of mammals, and it is because it has been preserved long after its function has disappeared that we find it occurring in the body of man.

Rudimentary organs for the most part display a congenital lack of the power of resistance, and, as Darwin suggested, for this reason they are frequently the seats of disease. When Darwin wrote his work on the " Descent of Man," more than a quarter of a century ago, many fatal cases of inflammation of the appendage had not been recorded. Darwin quoted only two cases as known to him. Since then, appendicitis (the name given by American surgeons to the first acute or to the chronic inflammation of the appendage) has become a well-known disease in Europe and

America, and occupies considerable space in treatises on the pathology of the digestive tract.

To give an idea of the prevalence of appendicitis, I may mention that in a single Paris hospital (Hôpital Trousseau) four hundred and forty-three cases of the disease have been treated in the five years 1895-1899.* In many of these cases the subjects were infants, as these as a rule are much more subject to appendicitis than are the aged. According to Treves,† the well-known English surgeon, 36 per cent. of the observed cases were under twenty years of age. Among old men, on the other hand, appendicitis is a rare exception. The varying incidence of the disease at different ages no doubt depends on the fact that in old age the appendage is often obliterated. The more easy communication with the other portion of the gut may be, the more chance there is for inflammation to occur. As it has a muscular layer, the appendage is able to void its fœcal contents; and a Scotch surgeon, Parker Syms,‡ has seen an appendage that he had removed, in the act of writhing about like an earthworm. Such movements, undoubtedly, would aid the discharge of the contents of the cavity.

The movements of the appendage, however, are usually feeble, and thus stagnation of the contents is common. Foreign matter is often found in the cavity, such as the pips of fruit, seeds, hairs, thorns, and in rare cases pins or even tin-tacks. Such bodies are capable of wounding the inner wall of the appendage, and so giving an opportunity to the microbes that abound in the digestive tube, with the result that microbial infection and inflammation of the organ is produced. Often, too, intestinal worms pass into the appendage and become the carriers of pathogenic organisms.

---

* Lannelongue, in the "Bulletin médical," p. 621, 1902.

† Treves, "The Surgical Treatment of Perityphlitis," London 1895.

‡ *Edinburgh Medical Journal*, August 1893.

Appendicitis is usually a grave disease, and is fatal in from 8 to 10 per cent. of cases. It would be difficult to find anywhere else in the human body so flagrant a case of natural disharmony. The organ in question may be obliterated or removed without disturbance of function, and, moreover, in its normal condition is a frequent cause of serious illness!

The vermiform appendage is not the only part of the digestive canal that is out of harmony with the maintenance of life and health. The cæcum itself, of which the appendage is only a portion, is degenerating in the human body, as I stated in the last chapter. The human cæcum, in fact, is very little developed in comparison with the cæcum of most herbivorous animals, in which it is a true organ of digestion. In the human embryo the cæcum and the appendage are relatively better developed than they are in the adult.

Disharmony is exhibited in the human body not only by rudimentary organs such as the wisdom teeth and the appendage, or by degenerating organs such as the cæcum. Some very large parts of our alimentary canal must be regarded as useless inheritances, bequeathed to us by our animal ancestors. It is no longer rash to say that not only the rudimentary appendage and the cæcum but the whole of the large intestine are superfluous, and that their removal would be attended with happy results. So far as digestion goes, the latter portion of the alimentary tract is of little importance. Even from the point of view of absorption of the products of digestion its importance is strictly secondary. And so it is not astonishing to find that the removal or disappearance of nearly the whole of the large intestine can be supported well by man.

As one result of the astonishing progress of surgery, it has been found possible to excise certain parts of the gut, and particularly of the large intestine. Thus, in one case, Körte * removed, along with part of the small intestine, a considerable part of the large intestine, leaving in place only the terminal portion. The patient, who underwent eight successive abdominal operations, recovered. In the case † of another patient, operated on by Wiesinger, two coils of the large intestine (the transverse and descending colons) which were ulcerated, were isolated from the remainder of the gut, while the upper portion of the large intestine (the cæcum and the ascending colon) was sutured to the rectum. In spite of these serious interferences with natural structure, the patients recovered, and appeared to derive great advantage from the loss of the large intestine.

I have quoted only two out of many similar cases. However, apart from surgical evidence, there exists proof of the uselessness of the large intestine in man. The best argument in favour of the proposition may be drawn from the case of a woman who for thirty-seven years discharged the waste matter from the alimentary canal through an intestinal fistula. The latter had opened spontaneously, as the result of an abscess seated on the right side of the abdomen. Her complaint, however, had not prevented her from marrying, from bearing three children, nor from pursuing an arduous calling. The person in question, who was a workwoman in Varsovie, was examined by a surgeon, M. Ciechomski,‡ thirty-five years after the establishment of

---

* "Archiv für klinische Chirurgie," vol. XLVIII., p. 715, 1894.

† "Münchener medicinische Wochenschrift," 1898.

‡ "Archiv für klinische Chirurgie," vol. XLVIII., p. 136, 1894.

the fistula. The surgeon proposed to operate, hoping to restore her to the normal condition, and the woman consented. However, when the abdominal cavity was opened, it appeared that the large intestine had atrophied along the whole length, from the cæcum to the rectum; the inner orifice of the fistula had passed into the digestive tract above the cæcum, opening into the small intestine. In the circumstances it was impossible to close the fistula, and the surgeon had to close up the abdominal wall, leaving the patient in her former condition. The woman recovered rapidly, and continued her usual mode of life. She came under observation again two years later, but since then had been lost sight of. The fact that a human being was capable of carrying on an apparently normal life for thirty years in the absence of a large intestine is good proof that the organ in question is not necessary to man, although it has not yet become rudimentary. In this case again, to find the useful stage of the structure, we have to go to our remote ancestors.

The large intestine is much better developed in most herbivorous mammals than it is in carnivorous forms. Although it is useless in the digestion of animal food, it has an undisputed importance in the digestion of vegetable matter. It has a very large calibre in herbivorous creatures, and the voluminous cavity contains quantities of microbes which are able to digest cellulose. As cellulose is a material that resists the ordinary processes of digestion, it is easy to see the advantage derived from the harbouring of the microbes. It is more than probable that in the horse, the rabbit, and in some other mammals, that live exclusively on grain and herbage, the large intestine is necessary for normal life.

On the other hand, the large intestine discharges a function similar to that of the urinary bladder. The urine, which is being secreted continuously by the kidneys, accumulates in the large reservoir provided by the bladder. Similarly the waste matter from the processes of digestion accumulate in the large intestine and remain there for a longer or shorter period.

In studying the natural history of the large intestine, it it striking that this portion of the gut is well developed only among mammals. These animals, for the most part, lead an extremely active terrestrial life. Most of them have to move about very quickly, the predacious forms in pursuit of their prey, the herbivorous forms to escape from their enemies. In such a mode of life, the need to stop in order to empty the intestines would be a serious disadvantage, and the possibility of retaining the dejecta in a large reservoir would be very useful.*

Such are the causes that have determined the growth of the large intestine among mammals. Birds, which live, so to speak, in the air, and which do not need to arrest their locomotion in order to void their excreta, have no large intestine. Reptiles and amphibia, although they live a terrestrial life, do not require a voluminous large intestine, and such is not found among them. These animals do not have a fixed temperature ; they are what we know as "cold-blooded," and in consequence are small eaters. Most of them are sluggish, and do not lead an active existence like that of mammals.

In the legacy acquired by man from his animal ancestors, there occur not only rudimentary organs that are useless or harmful, but fully developed organs equally useless. The large intestine must be regarded as one of the organs possessed by man and yet harmful to his health and his life. The large intestine is the reservoir of the waste of the digestive processes, and this waste stagnates long enough to putrefy. The products of putrefaction are harmful. When fæcal matter is allowed to remain in the intestine, as in cases of constipation, a common complaint, certain products are absorbed by the organism and produce poisoning, often of a serious nature. Every one knows that a high temperature may be the result of constipation in women after child-birth, or in patients recovering from an operation. This is due to an absorption of substances produced by the microbes of the large intestine. Similar products may be the cause of an attack of acne or of other skin diseases. In fine, the presence of a large intestine in the human body is the cause of a series of misfortunes. The organ is the seat of many grave diseases, among which dysentery is notable. In some tropical climates dysentery is a serious scourge. According to Rhey,* it is "the greatest danger to which a European is subjected in Tonkin. It is responsible for more than 30 per cent. of the deaths caused by disease." European troops pay it a large annual toll in the colonies of the French and English.

---

* This topic is discussed at length in my lecture, published in the *Memoirs and Proceedings of the Manchester Literary and Philosophical Society*, 1901, vol. XLV., note 5.

Malignant tumours seem to display a predilection for this region of the digestive tract. Thus, among 1148 cases of cancer of the alimentary tract recorded in the Prussian hospitals in 1895 and 1896, 1022, or 89 per cent., affected the large intestine, including the rectum and cæcum.† The small intestine is the only part of the digestive tract that is indispensable, and it is attacked to a much smaller extent, providing only 11 per cent. of the cases of intestinal cancer. The probable explanation of these facts is that the contents of the gut remain in the small intestine a shorter time than in the large.

---

* "Archives de Médicine navale," 1887.

† Ewald, "Klinik des Verdauungskrankheiten," vol. III., p. 267, 1902.

Stagnation is a familiar cause of disease, and is the probable cause of the frequency of cancer of the stomach. Of 10,537 cases of cancer of all parts of the digestive tract recorded in the Prussian hospitals in the same period, 4288, or more than 40 per cent., affected the stomach. The latter organ is one that the human body would do well to be rid of. It is not so useless as the large intestine, since it is the chief seat of digestion of albuminous substances, but the small intestine could take its place. Moreover, cases are known in which surgeons have removed cancerous stomachs. The results of such operations were favourable, to the extent that the patients survived and were able to absorb sufficient nourishment. They had to eat rather more frequently, and performed the processes of digestion by means of the secretions of the small intestine and pancreas.

It is not surprising to find so many instances of useless or harmful organs in the alimentary tract. Our ancestors were creatures that fed on crude and rough materials, such as wild plants and unprepared flesh. Man has learned to cultivate plants that are digested easily, and to prepare his meats in such a fashion as to be readily digested. The organs that were adapted to the mode of life of the animal predecessors of man have become to a large extent superfluous. Many creatures that have found the opportunity of obtaining their nutriment in a highly digestible condition have lost, more or less completely, the digestive organs. Many parasites are instances of this, as for example the tape-worms, which live in the human digestive tract, bathed by a nutritive fluid which they absorb directly; they have lost the digestive tract completely.

In the case of man such an evolution has not occurred, and there remains in the body a harmful organ like the large intestine. In consequence, it is impossible for him to take his nutriment in the most perfect form. If he were only to eat substances that could be almost completely absorbed, the large intestine would be unable to empty itself, and serious complications would be produced. A satisfactory system of diet has to make allowance for this, and in consequence of the structure of the alimentary canal, has to include in the food bulky and indigestible materials such as vegetables.

At this point I may refer to a topic of considerable general interest. Animals, in the choice of food for themselves or for their young, are guided by a blind and innate instinct. As I have shown in my second chapter, creatures like the fossorial wasps select only particular species of spiders or insects. Instinct directs them to the kind of food best suited to the wants of their progeny. Bees are attracted by the sweet juices of flowers; the silkworm instinctively devours the leaves of the mulberry and rejects most other plants. In higher animals, instinct plays the chief part in the choice of food. The difficulty of getting rats to eat poisoned food is well known; an instinct warns them of the danger of the material offered to them. In the same way dogs refrain from food that has been poisoned.

Every one has seen the minute attention bestowed by a monkey on food before beginning to eat it. It turns over what is offered, smells it carefully, cleans it, and before beginning to eat, subjects it to an examination that seems to us ridiculous. Monkeys often throw away food without even biting it. None the less, in spite of an instinct so highly developed, monkeys poison themselves with all sorts of dangerous substances, even when these exhale a strange odour. I have seen monkeys die poisoned by the phosphorus of matches, or even by iodoform which they had contrived to steal.

In the case of man, aberrations of instinct in the choice of food are common. As soon as babies begin to walk, they lay hold of everything and try to eat it. Bits of paper, lumps of sealing-wax, the mucous matter from the nose, all appear to them to be things to eat. Constant guard has to be kept to prevent them from doing themselves an injury. Fruits and berries they cannot resist. Cases of poisoning very naturally are extremely frequent, and as every one must know of instances, I shall mention only a single case. "Messrs. Beadle and Sons, oil manufacturers at Boston, had thrown out, from the door of their establishment, a quantity of castor beans that were decayed and useless. Some children playing in the street mistook the seeds for pistachio nuts, and shared them with their friends. All the children seem to have eaten of them, with the result that more than seventy showed serious symptoms of poisoning." *

The consumption of ergotised rye and of maize contaminated with certain leguminous plants (*Lathyrus*) frequently produces epidemics of poisoning without instinct intervening to protect the victims.

While the large intestine, acting as an asylum of harmful microbes, is a source of intoxication from within. the aberrant instinct of man leads him to poison himself from without with alcohol and ether, opium and morphia. The widespread results of alcoholism show plainly the prevalent existence in man of a want of harmony between the instinct for choosing food and the instinct of preservation.

---

* Stillmarck, in "Arbeiten des pharmacologischen Institutes zu Dorpat," vol. III., p. 110, 1889.

The digestive apparatus, then, affords abundant proof of the imperfection and disharmony of our nature. Moreover, there are many other proofs, as I shall show in the chapters to follow.

CHAPTER V

DISHARMONIES IN THE ORGANISATION AND ACTIVITIES OF THE REPRODUCTIVE APPARATUS. DISHARMONIES IN THE FAMILY AND SOCIAL INSTINCTS

I

Remarks on the disharmonies in the human organs of sense and perception.—Rudimentary parts of the reproductive apparatus.—Origin and function of the hymen

THE digestive organs are not alone amongst the parts of the human body in exhibiting a greater or lesser disharmony. More than fifty years ago, a great German physiologist, Johannes Müller, showed that although the human eye was regarded as a very perfect organ, its power of correction for aberration of light was poor. Helmholz, another famous German man of science, stated that the optical study of the eye brought complete disillusion. " Nature," he said, " seems to have packed this organ with mistakes, as if with the avowed purpose of destroying any possible foundation for the theory that organs are adapted to their environment." Not only the eye, but the other organs by means of which we are conscious of the outside world, present natural disharmony. Therein lies the cause of our want of certainty about the sources of our perceptions. Memory, the faculty that registers our mental processes, becomes active much later than other faculties lodged in the brain. If the new-born human child were relatively as well developed as the young guinea-pig, it is probable that we should know far more as to the history of our consciousnees of the external world. But without lingering over the disharmonies in our senses and faculties, I shall pass at once to a consideration of the apparatus for maintaining the species.

I have shown that the alimentary tract, the chief organ involved in the maintenance of the individual life, affords no proof of the theory that human nature is perfect. Is it the case that the organs of reproduction give a better result? When I wished to describe the most perfect examples of harmony to be found amongst plants, I chose the mechanism by which fertilisation is accomplished in flowers. The persistence of the species is secured, in the case of flowers, by a marvellous series of structures and functions.

Is the maintenance of the human species similarly provided for? A detailed investigation of the male and female human reproductive organs shows that these contain parts of diverse origin. The apparatus contains portions of extremely ancient origin, and portions that have been acquired recently. The internal organs display traces of a remote hermaphroditism. In the male, there occur traces of the female apparatus, rudiments of the uterus and fallopian tubes. In the female, on the other hand, rudiments of the male structure persist. These traces date very far back in the history of the race, for they occur also in most other vertebrates. The facts seem to indicate that, at a very remote period, the ancestral vertebrates were hermaphrodite, and that they became divided into males and females only gradually, still retaining in each sex traces of the other sex. Such traces occur frequently, even in adult man, in the form of rudimentary organs (known as the organs of Weber, of Rosenmüller, and so forth). The rudiments not only are functionless but sometimes, as frequently happens with atrophied structures, form the starting-point of monstrous growths, or of tumours that interfere with health. Thus the hypertrophy of a part of the male prostate gland (the organ of Weber) brings about the formation of a *uterus masculinus*, and so produces a sort of abnormal hermaphroditism. The rudimentary organs in the male reproductive apparatus frequently are the starting-points of hydatid cysts. In the female, cysts such as those of the *parovaria* are produced by the proliferation of rudimentary structures. These, although usually benign, not infrequently become malignant. Lawson Tait,* a celebrated English surgeon, has published a case of this kind. He removed from a young woman a parovarian cyst that was apparently benign, but in six weeks symptoms of cancer arose, and the patient died of cancer in three months.

A comparison of the rudimentary organs in the human reproductive apparatus with those in the similar structures of lower animals, shows that many relics have degenerated further in man than in other animals. Thus the duct of the embryonic kidney (known as the Wolffian body) is of rare occurrence in adult man, although it is retained throughout life in the case of some herbivorous animals, in which it is known as Gaertner's duct. There are, however, many rudimentary organs in the human reproductive apparatus, organs that are always useless and not infrequently more or less harmful to health and life.

Alongside organs which have been useless from time immemorial, the reproductive system of man possesses structures of recent acquisition. These deserve special attention, as it might have been supposed that in them would have been found special instances of adaptation to the reproductive function.

---

* The case is quoted in Pozzi's "Traité de Gynécologie," p. 714, 1890.

I have already referred (chap. iii.) to the discussions that have taken place over the simian origin of man. All attempts to demonstrate the presence in the human brain of parts that were absent in the simian brain have failed. It is a curious fact that man displays a more marked difference from monkeys in the structure of the reproductive system than in the structure of the brain. There is no *os penis* in man. This bone, which facilitates intromission, occurs in many vertebrates, not only among rodents and carnivora, which are widely separated from man, but in many monkeys, and most notably in anthropoid apes.* For some reason impossible to establish, man has lost this bone. It may be that certain ossifications of most rare occurrence † may represent an atavistic inheritance from our remote ancestors.

In the male sex the difference between man and the anthropoid ape is the loss of an organ; in the female sex it is the acquisition of an organ. The hymen, the physical indication of virginity, is peculiar to the human race. That organ would serve the purpose of those disputants who make every effort to discover the existence of a structure peculiarly human, far better than the posterior lobe of the brain, or the hippocampus minor. Bischoff ‡ has determined its absence in the anthropoid apes, and his result has been confirmed by other observers. Deniker[*] failed to find it either in the fœtal gorilla or in the young gorilla. In the case of the fœtus of the gibbon, he found a slight elevation round the entrance to the vagina "which might be homologised with the hymen,"[†] but which, however, was not the membrane in question. Deniker[‡] himself decided that the "membrane was absent in anthropoid apes at all ages." Weidersheim, in his summary of the organisation of the human body,[§] also sets down the fact that "in monkeys a hymen is not present."

---

* Crisp, "Proceedings of the Zoological Society of London," p. 48, 1865.

† Lenhossek, in Virchow's "Archiv. für pathologische Anatomie," vol. XL., p. 1.

‡ "Abhandlungen der mathem.-physikal. Classe d. K. Bayerisch. Akad. d. Wissensch. München," vol. XIII., Part II., p. 268, 1880.

The fact that this structure appears late in the development of the female fœtus bears out the supposition that it has been acquired recently by the race. According to several observers, who agree in this matter, the membrane does not develop until at least the nineteenth week of fœtal life.

Although organs very ancient in origin, and now become degenerate rudiments, may be useless, it is to be expected that an organ of recent appearance and still in a progressive condition, would have an important function. Of what utility is this membrane to a woman? Wiedersheim[||] remarks that its function has not been made out.

The hymen sometimes plays a large part in family and social relations, and, regarded as the evidence for virginity, has had moral significance bestowed on it. A minute examination of this structure is frequently a part of the judicial procedure in cases of supposed rape and so forth. The destruction of the hymen has led to the death of many hundreds of men and women.

From our point of view, however, it is the possible physiological function of this structure that is interesting. It seems impossible to conclude otherwise than that in existing races it has practically no functional value. Its atrophy as the result of sexual congress not only is no bar to sexual relations, but removes an unpleasant impediment. In many races the structure is removed as soon as possible. In some parts of China it is destroyed as part of the toilet of young children, and indeed many Chinese physicians are ignorant of its existence. A similar state of affairs occurs in some parts of India. In Brazil, among the tribe of Machacuras, virgins, in the European sense, do not exist, for the mothers destroy the hymen in female children soon after birth. In Kamchatka the aborigines regard it as disgraceful to be married with the hymen intact, and the mothers operate on their daughters.* Among other races, again, the disagreeable duty of defloration is assigned to special persons. Among the natives of the Philippines there formerly existed well-paid public officials the duty of whom was to destroy the virginity of the girls and so to make marriage pleasanter for the husbands. A similar custom occurs among the inhabitants of New Caledonia, and Moncelon states that there virginity is held in little esteem. "I have proof of the curious circumstance," he wrote, "that when a husband shrinks from destroying the virginity of his wife, he employs some one from a regular profession to take his place."

---

[*] *Loc. cit.* p. 245.

[†] *Loc. cit.* p. 250.

[‡] *Loc. cit.* p. 253.

[§] *Loc. cit.* p. 163.

[||] *Loc. cit.* p. 208.

Such examples, selected from amongst many, may be taken as proof that even such a peculiar and recently acquired organ has not a physiological use.

On the other hand, especially among Christians and Mahomedans, the existence of the hymen in an intact condition is regarded as very important. The ancient Jews began to set a high value on virginity. According to the old Mosaic law, if, at the time of her marriage, a young girl were found to be no longer a virgin, "Then they shall bring out the damsel to the door of her father's house, and the men of her city shall stone her with stones that she die; because she hath wrought folly in Israel, to play the whore in her father's house" (Deut. xxii. 21). The religions that have sprung from Judaism have retained this old view of virginity, although in an attenuated form. Among some Christian peoples, material proofs of virginity at the time of marriage are demanded, and among some Mahomedans such proofs are exhibited to friends and relations on the day after marriage. However, the actual defloration is not always left to the husband, but among Arabs and Copts and amongst the natives of Egypt, the operation is performed by a specially selected matron.*

---

* Ploss-Bartels in "Das Weib," Seventh Edition, 1902. Vol. II., pp. 228–229 is the source of information on this matter.

It is plain, then, that this membrane is of no direct service in the sexual process. It may even give rise to more or less serious misfortune. Thus, when it is unusually rigid, the adjacent peritoneum may be torn and the results may be disastrous. Occasionally the rupture of an abnormally vascular membrane may give rise to bleeding of a prolonged and even fatal character.† Moreover the membrane is a frequent seat of ulcers, specific or otherwise.‡

I have already mentioned that among some races a rigorous toilet involves the destruction of the hymen. It is plain that the existence of the membrane interferes with strict hygiene of the vagina, especially at the periods.

---

* Ploss-Bartels, *loc. cit.* vol. I., p. 489.

† Pozzi, "Traité de Gynécologie," p. 1067, 1890.

‡ "Real-encyclopädie d. Gesammten Heilkunde," Second Edition, vol. X., p. 34, 1885.

Probably some blood is retained by the membrane and furnishes a soil for microbes that may be dangerous to health. It is quite possible that certain forms of anæmia, as for instance the chloranæmia of virgins, may be produced by microbal growth. This would easily explain why marriage is the readiest cure for such anæmia, as marriage involves destruction of the membrane, and so makes possible the complete discharge of fluid from the vagina.*

What then can be the meaning of this organ, useless as it is for the sexual functions, sometimes dangerous to health, an organ that is no ancestral heritage and that must be destroyed by the act of sexual union? Formerly, when it was accepted that characters acquired in individual life could be transmitted to offspring, the question was asked as to why this membrane had not disappeared. The instance was one of those which helped to overthrow the dogma of the inheritance of acquired characters.

Although it is useless to existing man, this organ may yet come to be explained by science. As yet we have to fall back on suppositions. The hypothesis which seems most probable is that in the earlier period of the existence of the human race, sexual relations were begun at a very early age, before the male organs were mature. Under such circumstances the hymen would not only not have been a barrier, but would have made congress more satisfactory. Gradually the hymen would have become dilated without being torn, until it was capable of admitting the adult organ. This hypothesis implies that in early times the membrane was not brutally torn, but that it was gradually dilated and that violent rupture is a modern necessity. In support of the hypothesis it may be mentioned that amongst certain living races sexual union begins at a very early age. In Ceylon, marriage takes place when the boys are from seven to ten years old and when the girls are from four to six years, according to Roer, or about eight years according to Beierlein. After the actual wedding ceremony the bride returns to the house of her parents, and it is only a few years later, when she is adult, that she goes to her husband. Roer states that he has seen cases where a father and son were attending school together.

---

* It would be interesting to find out whether or no Hindoo or Chinese virgins suffer from *chloranæmia;* at present we have no information on this matter.

Among the Vedas, a low caste of tropical India, boys marry at the age of from fifteen to sixteen years, certainly before the sexual organs have attained their full dimensions. The missionary Etern was struck with the agitation of the natives of Keradif (in Abyssinia) when they were ordered within fourteen days to marry all their boys more than fourteen years old to girls more than nine.* In Madagascar, in the beginning of the seventeenth century, it was the custom for boys to marry at an age of from ten to twelve years. The natives of German New Guinea marry their boys at the age of fourteen to fifteen. Even in England a law still exists permitting marriage to boys fourteen years old. The law is now a dead letter, but is evidence of the ancient practice.

It is known that even at the present time the hymen is not always ruptured in sexual congress. Budin has recorded its existence in seventeen per cent. of primiparous women. Among seventy-five cases of women in their first confinements he found the hymen intact in thirteen cases. Since provision for children has fallen on fathers these have taken to deferring marriage to a later age than when children were left to the mother. That is the probable reason why there are now fewer married boys. Thus, formerly, the proportion of women who at the first childbirth still possessed unruptured hymens, was much greater, and it is not difficult to suppose that in still earlier times such a condition was normal. It is plain that there is here an instance of a very recently acquired disharmony.

---

* Ploss-Bartels, *loc. cit.* p. 622.

The homology between certain portions of the male and female reproductive apparatus is well known. The male homologue of the female hymen is a little fold that hinders the mingling of urine with the seminal fluid during emission, and that is known to anatomists as the *caput gallinaginis* or *colliculus seminalis.* It is very much smaller than the hymen, so that we cannot regard the latter as a rudimentary homologue of a useful organ. However, the prepuce of the male is a clear instance of the presence in the male organs of useless parts. It is removed by circumcision among very many races, such as the Hebrews and Arabs, and other Mahomedans, and amongst Persians. negroes, Hindus, Tartars, and its absence seems to bring about no inconvenience.

II

Evolution and significance of the menstrual flow in women.—Precocious marriage among primitive and uncivilised races.—Disharmony between age of puberty and age of nubility.—Age of marriage.—Examples of disharmony in the development of the reproductive function.

Notwithstanding their imperfections, the human organs of reproduction are able to fulfil their functions. A close scrutiny, however, shows that there are many sides on which they are disharmonious or badly adapted.

The occurrence of bleeding is usually a sign of disease.

Bleeding from the nose or of the lungs or intestines or kidneys is an indication of disease more or less serious. Discharge of blood from the female reproductive organs may also be an indication of disease, as for instance when due to tumours of the uterus. The only exception to the rule is the periodic flow in the case of women, by which they lose hundreds of grammes of blood (100 to 600 gr.). There is something paradoxical in such a physiological occurrence, and it deserves minute consideration.

These periodic losses, unlike the possession of a hymen, are not a peculiarity of the human female. "Heat" in lower animals is analogous, although in that case the chief indications are swellings of the mucous membrane with a slight discharge of fluid, hardly tinged with blood. The state indicates the awakening of the sexual instinct and readiness for coition.* Among monkeys there has been observed a flow much more closely resembling that of woman. In the case of macaques and cercopitheci, it has been observed even that the flow is monthly. Heape,† while in British India, took advantage of a valuable opportunity for making observations on this subject.

Among two hundred and thirty females of *Macacus rhesus* of which the greater number were adult or nearly so, seventeen displayed signs of menstruation, consisting of a swelling of the genitalia accompanied by the discharge of a pale and viscid fluid. Usually the flow assumed a pale rose tint, due to the presence in it of blood corpuscles, but cases where it was highly coloured were rare.

Although they are distinctly analogous to the menstrual flows of women, these occurrences in monkeys are distinguished by the predominance of the swelling of the genitalia, the viscid character of the discharge, and the relative absence of blood. They present a condition intermediate between the "heat" of lower animals and the human phenomena.

---

* Saint Cyr, "Traité d'obstétrique vétérinaire," p. 52, Second Edition, 1888.

† *Philosophical Transactions of the Royal Society of London*, 1897, pp. 135–166.

In anthropoid apes a similar menstruation has been observed. Bolau, Ehlers, and Hermes, record it in the case of the chimpanzee. "At this period," wrote Hartmann,* "swelling and reddening of the genitalia occurred. The labiæ majores, which are usually inconspicuous, enlarged greatly, and a similar increase took place in the labiæ minores and the clitoris."

In the case of women swelling of the genitalia is very slightly marked, and the chief occurrence is the flow of blood. It is plain, then, that something new has been acquired in the menstruation of women.

The condition of the flow at the present time is probably the result of modifications acquired recently in the history of the race. Among primitive peoples sexual union occurred at a very early age, and pregnancy occurred before menstruation. The latter did not appear during pregnancy nor in the time of suckling, and probably the latter was hardly over before a new pregnancy had occurred. In that way there was no opportunity for the onset of menstruation.

The human capacity for procreation throughout the year made the race extremely prolific. Probably this prolificness is the reason why man has spread over the surface of the earth, and has multiplied so enormously, in spite of the barriers to his progress and the high rate of mortality to which he is subjected.

---

* "Verhandlungen der Berliner Gesellschaft für Anthropologie," p. 88, 1876.

Instances are known from recent observation of pregnancies occurring before the onset of menstruation. According to Rhode, among the Guatos, Indians inhabiting the mouth of the Rio Sâo Lourenzo in Paraguay, married women not more than five to eight years of age are to be met with, and these must have married before menstruation. Among the Vedas of tropical India, girls marry before they are nine years of age, and have relations with their husbands before sexual maturity. In Chiras in Persia, girls marry before puberty, and while their chests are still flat. In Syria, according to Robson, girls marry at the age of ten, and so before puberty. Du Chaillu related that the Achira of West Africa did not defer marriage until after the appearance of puberty. Abbadie, while on his voyage in Nubia, found that men bought young girls and had sexual relations with them before the time of menstruation. Among the Atjeh of Sumatra, girls marry at an age certainly before that of puberty, as they have hardly lost their first set of teeth. Although the husbands are a few years older, they are still unfitted for sexual union. The couples sleep together, and attempt sexual union before they are fitted for it. Among the islanders of Viti, again, marriage takes place before puberty.

The ancient Hindoos married at a very early age. Bötlingk quotes from the Sanscrit poems in which hell was awarded to the fathers of girls who had not been married when puberty came on. In other verses it was written that not only the father but also the mother and the elder brother were to be carried down into hell if the daughter began to menstruate before she had been married ; the girl herself was to descend to the lowest degree of Çûdrâ, and was never to be taken as a wife.

There is no doubt as to the possible fertility of marriages contracted at these early ages. Polak * gives examples taken from Persia. It is not necessary for impregnation that it should have been preceded by a menstrual flow. Facts making this clear have occurred not only in warm climates but in our own latitude. Rakhmanoff,† in Russia, attended in childbirth a woman not more than fourteen years of age, of poor constitution, and badly nourished, and with features still infantine. Menstruation had not yet taken place ; the confinement was normal.

It is reasonable to suppose that in former times these early marriages of girls under the age of puberty were more common, if indeed they were not customary. In such circumstances menstruation would have been a rare phenomenon.

It must be remembered that the examples of menstruation observed in the case of monkeys were taken from creatures living in abnormal conditions, isolated in zoological gardens and passing their lives in captivity. It is highly probable that the periods as they exist to-day, with copious sanguineous discharge, are a recent acquisition of the human race.

As he emerged from the primitive condition man had to restrain his prolificness. The history of savages and of civilisations shows that progress and culture have been accompanied by a rise in the age for marriage. In this way the menstrual periods could develop without check, and attain the present condition. In these circumstances it is not wonderful that menstruation should appear so abnormal and even pathological. A copious discharge of blood, preceded and accompanied by pain and by nervous and mental distress as so frequently happens, has no apparent kinship with the processes of normal life.

---

* Ploss-Bartels, *loc. cit.* p. 625.

† Vratch, in Russian, p. 1456, 1901.

It is now easy to see why among so many races there are special rules made for women during this period. Most of the races of the earth, says Ploss, regard menstruating women as impure. The occurrence is so widespread that it is unnecessary to adduce particular cases, but a few with some point of special interest may be noticed. Thus, among the Hindoos a high-caste woman is regarded as a pariah in the first day of the period, and as one of the murderers of Buddha on the second day. Among many races a woman in this condition is forbidden to come near men, or to touch a number of objects, as she is regarded as capable of setting up many diseases and of doing serious damage. The Germans of the eighteenth century believed that the hair of a menstruating woman buried in manure would engender snakes.

It is not surprising that the origin of menstruation has been attributed frequently to evil spirits. The Iranians held that it appeared first in Dchahi, the goddess of immorality.* Such opinions implied vaguely that there was something abnormal in the process. The history of the evolution of menstruation explains well the origin of such a notion.

Another bizarre and apparently abnormal feature of the reproductive processes receives explanation in the history of its evolution. The feature in question is the painfulness of childbirth. It is truly astonishing and singular to find a phenomenon essentially normal from the point of view of physiology accompanied by pain of so marked a character. No doubt other animals suffer during labour, but among the mammalia woman undergoes the severest pain.

Observations made on several Europeans who have been brought to bed at an abnormally early age have shown that, contrary to all expectation, parturition was easy and the sequelæ normal.† Moreover, Dr. Dionij has stated his opinion that of two cases of a first childbirth at the ages respectively of fifteen and of forty years, he would prefer the earlier age. The daughters of the colonists in the Antilles were accustomed to marry at very early ages. In 1667 Du Tertre related that a young woman of that region had informed him that the birth of her first child took place when she was twelve years and a half of age, and that the process lasted no more than a quarter of an hour and had been painless. The missionary Beierlein practised for long in Madras, where marriages were very early, and found that parturition was much more easy than in Europe. *

---

* Ploss-Bartels, *loc. cit.* p. 443.

† Rakhmanoff.

On the other hand, certain facts show that too young mothers are subject to a very heavy rate of mortality during childbirth, and soon after it. The most salient fact in this connection is furnished by Hassenstein, who has stated that the mortality of labour cases in Abyssinia is 30 per cent., and who has attributed this death-rate to the circumstance that marriage takes place before the body of the woman is sufficiently developed.† In British India the disadvantages of precocious marriage have been repeatedly urged; and in a petition relating to this subject, Dr. Mansell referred to the case of a woman of twelve years of age in whom parturition was interfered with by the undeveloped condition of the pelvis, so that the head of the child had to be destroyed.

Matthews Duncan, the well-known English obstetrician, paid much attention to the mortality of labour cases, with the object of deciding the best age for marriage. He came to the conclusion that women from twenty to twenty-four years of age were best fitted for labour, that is to say, showed the lowest rate of mortality during labour or as a result of labour. He also showed that such women were most fertile,

---

* Ploss-Bartels, *loc. cit.* p. 626.

† *Ibid.* p. 626.

and that the development of the pelvic bones was completed at that period of life. Women who were of a lower or higher age showed a greater mortality rate in connection with childbirth.

The facts of which I have just given a summary lead directly to a most striking instance of disharmony exhibited in the order of the development of the human reproductive apparatus. Puberty declares itself in a woman by the beginning of menstruation at a time when girls still possess infantile characters and when the bones of the pelvic basin are not yet fully developed. Obviously there is a disharmony between puberty and the general maturity of the body, that is to say, the nubile condition.

This disharmony becomes still more evident upon a closer examination of the phases of development of the different reproductive functions. In the human race, reproduction is brought about by the union of the sexes suggested by sympathy or mutual love. The sexual union makes it possible for the male elements or spermatozoa to reach the eggs and fertilise them by passing into them. It might have been expected that the different steps in the process would have been attuned so as to act in harmony. As a matter of fact there is no such relation. The different factors of the sexual function develop independently and unharmoniously.

Love and the sexual sense in the human race appear before the other factors in the process. Ramdohr,* in the eighteenth century, stated that little boys frequently exhibit amorousness towards women. They are capable of being strongly affected by jealousy and by desire of exclusive possession of the coveted woman. This fact is well known, and has been related of famous personages. Thus Dante, at the age of nine, fell in love with Beatrice ; Canova was in love when he was little more than six years of age, and Lord Byron was in love with Mary Duff at the age of seven.*

---

* "Venus Urania," Leipzig, 1798.

Sexual excitability appears at an age when there is no question but that the sexual elements are undeveloped. In infants still in the cradle, observers have noticed movements and attitudes showing the presence of sexual excitability. Curschmann and Fürbringer,† both competent clinicians, have noticed these feelings in children under the age of five. Later on in life, the development of the sensibility is more common, and is practically universal among boys before the time at which the spermatozoa are ripe.

This disharmony is the cause of onanism, which is common everywhere among boys. Before ordinary sexual congress is possible for them, boys experience the characteristic pleasure of the sexual sensations, and by a kind of natural instinct learn self-gratification. Onanism is sometimes defined as a "gratification of the sexual desire by unnatural means." ‡ But it is man's constitution itself that permits the development of the sensation precociously, before the development of sexual maturity. Letourneau is right when he says that such sexual aberrations are abnormal, but not unnatural, as they occur among animals.

In the case of young boys the habit is so common that, according to Christian,§ "very few are able to say that they have avoided it completely." The same writer asks the question: "If it be remembered that onanism among certain peoples, at certain times, has been recognised as an ordinary event, it is difficult to avoid asking if there be not a latent vice, hidden in the depths of human nature, and ready to be provoked into activity by very small causes ?" The answer is sufficiently plain. The cause of onanism, this "vice" or "crime," as Tissot and other authors have called it, undoubtedly is the result of a natural disharmony in the human constitution, of a premature development of sexual sensation. Among the most civilised races and the lowest savages the mode of satisfying the premature demand is equally common.

---

* Moll, "Untersuch. über die Libido Sexualis," vol. I., p. 44.

† "Real-encyclopædie der gesammt. Heilkunde," vol. XIV., p. 593. Second Edition, 1888.

‡ Fürbringer, *loc. cit.*

§ "Dictionnaire encyclopédique des Sciences médicales," vol. XV., p. 378, 1881.

It is to be noticed that onanism is more common and earlier developed in the male sex. The development of sexual irritability in the female occurs very irregularly. In some races onanism is so much a custom among little girls that no attempt is made to conceal the practice. This occurs, for instance, among certain Hottentot tribes, and is referred to openly in talk and legends.* Similar instances occur elsewhere, but in most races the practice is thought wrong, and is concealed as much as possible.

Among girls,† onanism is less frequent than in the case of boys, a circumstance in relation with the fact that sexual sensation usually appears much later in the female sex. It is almost a general rule that girls who have arrived at sexual maturity have not acquired sexual irritability, while to many it comes only gradually after marriage. Sometimes it does not occur until after the first child has been born. On the other hand, love begins very early in young girls, although it long retains a platonic character and is not associated with sexual sensation until much later.

---

* Fritsch, "Die Eingeborenen Süd-Afrikas." Breslau, 1873.

† Information that I have obtained from the Zoological Gardens at Anvers would seem to show the existence of similar differences between the sexes in the case of monkeys.

The maturity of the spermatozoa in the male comes long after the development of sexual irritability and of love. None the less, it comes before the organism of the male is actually ready. It happens, in consequence, especially among the highly civilised peoples, that marriage and regular unions are impossible at the right time. The youth has his education to finish, his profession to choose, and he must be ready to support children before he is able to marry. As civilisation advances, the age of marriage becomes later and later. In the case of Europeans, sexual maturity occurs in the male at the age of twelve to fourteen years, while the average age at the first marriage is shown in the following table :—

*Table of Age at First Marriage.**

Nationality.	Age in years of males.	Age in years of females.
English	25.94	24.69
French	28.41	25.32
Norwegians	28.51	26.98
Dutch	29.15	27.78
Belgians	29.94	28.19

These figures show clearly what a gap there is between the coming of sexual maturity and the age at which marriage can be undertaken.

The decay of the reproductive functions shows a series of disharmonies similar to those that occur during development. Spermatozoa continue to be formed throughout the greater part of the life of a man, and may still be found even in very old men. Pawloff, for instance, discovered that they were present in abundance in the case of a man at the age of ninety-four, and this observation is not unique.†

---

* Wappaeus, "Allgemeine Bevölkerungsstatistik," vol. II., p. 285, 1861.

† "Sur les Altérations pathologo-anatomiques des Testicules pendant la Vieillesse," St. Petérsbourg, 1894 (in Russian). A

But the presence of ripe spermatozoa is not the only condition necessary for functional virility. In the case of old men it happens frequently that there is incapacity to make normal use of the spermatozoa that are produced. This brings about a series of discomforts in the sexual functions of advanced life which, however, do not prevent the retention of the specific sensation and desire until a very extreme old age. Doctors, in hospitals devoted to old men, have noticed to what an extent their patients are engrossed by sexuality. Even some of the ancient authors have noticed how the amorous sentiments of old men turn into a perverted attraction to youths.

Sexual irritability and amorousness not only appear before sexual maturity and general fitness of the organism for marriage, but they remain after the disappearance of these. It is remarkable to notice how profound is the difference between the disharmonies of the reproductive functions in man and the perfect condition of adaptation of the same functions in the higher plants. In the case of the higher plants, as I described in my second chapter, the arrangements are complicated on account of the necessary mediation of insect life. Notwithstanding this, the perfection of the adaptation is remarkable. At the exact time when the reproductive products are ripe, the petals open and the nectar is secreted, while, in addition, at this time many flowers discharge odours agreeable to insects. Attracted by the scents and colours, the insects visit the flowers in quest of pollen or nectar, and, becoming dusted with pollen, carry it to the stigmas of the next flowers they visit. As soon as

few years ago, in course of the examination of the body of a man who had died at the age of 103 at Lyons, the seminal vesicles were found to be full of ripe and active spermatozoa. "Annales d'Hygiène publique," p. 370, 1900.

fertilisation has taken place the petals fade, the scents are no longer produced, and the insects cease to visit the flowers to which they are no longer necessary.

It is not surprising that the disharmonies in the human reproductive apparatus are a frequent source of trouble. Little children, in whom sexual irritability has awakened prematurely, learn to satisfy it by means called "unnatural." In many cases damage rapidly follows. "In the child," wrote Dr. Christian, "there is no secretion of spermatozoa, and it is in the child that the results of onanism are most disastrous to the organism, and disastrous almost in inverse proportion to the age.* It is in early infancy that this aberration merits the evil reputation that it has acquired; it compromises health, intelligence, and even life. Quite young children wither, becoming pale, stupid, and fragile, when they have acquired this disastrous habit. The evil is almost entirely a consequence of the unripeness of the organism for sexuality." Happily these evil occurrences are rare.

A publication by Tissot, a Swiss doctor, on the subject of onanism, made a sensation in the eighteenth century. The book was full of exaggeration, and it was very inexact, but it contained interesting confessions from persons who had contracted the habit. A woman wrote to Tissot in the following terms: "But for the restraint of religion, I should have put an end to my life, which is ruined by my own fault." Not infrequently the vice leads to melancholia.

Other unfortunate results come from the ripening of the sexual products before the organism is ready for marriage, and before the character has been formed. As men cannot contract marriage before they are ready for it, irregular and frequently harmful sexual aberration may occur.

---

* *Loc. cit.* p. 377.

The survival of this specific irritability until too late a period of life is another source of disaster. Old men who can neither excite passion nor satisfy it, often become victims of their own amorousness and unassuaged passions. It has been shown that passion may survive after the complete atrophy of the functions of the organs. Similarly it is the case that women from whom the ovaries have been removed, may continue to retain sexual irritability completely.

Disharmony of sexuality may also occur between persons of different sexes. The fact that sexuality is usually more precocious in the male sex often produces a disharmony in the case of married persons. At the time when a woman is still in full possession of this specific irritability, the appetite in the man may be on the wane. From this disharmony there often follows conjugal infidelity or passion between persons of the same sex.

Schopenhauer devoted attention to this subject and wrote as follows: "That nature herself may produce a condition totally opposed to the natural function offers a paradoxical problem of very deep interest." * It is clear, however, when we consider the disharmonies in the development and activities of the functions in question, that the apparently paradoxical and strange aberrations of sexuality are natural enough.

The existing disharmony gives rise to many evils from earliest youth to advanced age, and, consequently, it is not surprising to find that religions have denounced sexuality more or less severely. Dr. Christian expresses his astonishment "that in nearly all religions it has been considered a homage to the Deity to abstain from sexual

---

* "Die Welt als Wille und Vorstellung," vol. II., Supplement to chap. xliv.

intercourse." * It is simply because the disharmonies of sexuality lead to sexual aberrations that religions have found cause for denouncing human nature as vile.†

III

Disharmonies in the family instincts.—Artificial abortion.—Desertion and infanticide.—Disharmonies in the social instincts

As the functions of reproduction are seated deep in the organic world and none the less present cases of striking disharmony in mankind, it is not surprising to find similar want of adaptation in the family instincts of man, as these instincts have been acquired more recently and are less widespread in the living world.

It has been shown that the animal world provides many examples of onanism and of aberrations of sexual congress. On the other hand, there are no cases in the animal world in which pregnancy is destroyed by aberrant instincts.

To the human race belongs the distinction of having invented modes of sexual congress which are necessarily barren. No doubt the loss of the *os penis* has made such occurrences more easy, as the presence of that bone would render interruption of coition more difficult. But there are many ways in which the spermatozoa may be prevented from accomplishing their function, and these are so common and so familiar that it is unnecessary to enumerate them. In civilised countries procreation is limited chiefly by such means. In its early days, the human race must have been distinguished by its unusual procreative capacity, but with the growth of civilisation many devices have been employed to limit that.

---

* *Loc. cit.* p. 364.

† *See* chap. i.

Savages and races of low civilisation have recourse to artificial abortion rather than to means for preventing fertilisation, and abortion is almost universal among them.

The great treatise of Ploss, "Das Weib," to which I have made repeated reference, contains a whole chapter * on this subject. Deliberate abortion with the object of limiting the number of children is customary all over the globe. In most primitive races and among peoples of low civilisation it is practised openly without the smallest restraint. Many of these peoples have adopted the custom of limiting the family to two children by procuring abortion in subsequent pregnancies. The aborigines of Kaisar and of the islands of Watubela observe the rule strictly. Among the natives of the islands of Aaru it is rare to find more than three children in a family, because any others are destroyed by artificial abortion.

A similar custom is widespread in India, being quite as common among the Hindoos who are ruled by England as among independent races. In the peninsula of Kutch, women frequently procure abortion, and one woman boasted to Macmurdo that she had made use of the practice five times. Abortion is equally common in Africa and America.

Even in Europe there are nations amongst which abortion is permitted within certain limits. The Turks do not regard a fœtus as being really alive until after the fifth month, and have no scruple in causing its abortion. Even at later stages, when the operation becomes criminal, it is frequently practised. In 1872, at Constantinople, more than three thousand cases of abortion were brought before the Courts in a period of ten months. Under such circumstances it is not surprising that illegitimate children are rare in the East.

---

* Vol. I. chap. xxxv.

Artificial abortion is not a modern invention, but was common in ancient times. The old Greeks practised it openly, without any legal restraint. Plato regarded it as within the province of the midwife, and Aristotle permitted it to married people when a pregnancy that was not desired took place.

Steller, writing of the natives of Kamchatka of the eighteenth century, stated that among them marriage was contracted rather for sensual gratification than for the procreation of children, because they interfered with pregnancies by various kinds of medicaments and by violent operative interferences.

The arts by which abortion has been produced are numerous and varied. In addition to the administration of drugs, chiefly of vegetable origin, implements have been employed. The natives of Greenland use the ribs of seals or of the walrus, and the Hawaians of the Sandwich Islands employ for the purpose a wooden implement fashioned as a deity.

On the other hand, certain races have strongly opposed the practice of abortion. In the ancient world such races were the Medes, the Bactrians, the Persians, and Jews. Among the ancient Incas, abortion was a crime punished with death. Later on, the Christian nations followed this view. However, the reprobation of abortion occurs only in a comparatively small number of the nations of the earth, and even amongst these the practice is common in secret.

Animals which are unable to procure abortion very often destroy their young, as I described in the second chapter of this volume. In the human race, infanticide is too common. The Greeks and Romans did not regard the newly born infants as possessing any right to live. The old Germans held themselves free to expose their infants. The Arabs, before the faith of Islam had spread to them, were in the habit of burying many female children alive. In India a similar custom is common, and in China it is notorious. According to figures collected by Eitel,* the Chinese of the province of Canton very often kill female children immediately after birth. "It may be said," he wrote, "that the murder of female infants is the general rule among the Hak-lo, and especially among the Hak-ka of the agricultural classes. The Hak-ka themselves estimate the number of female children exposed as about two-thirds of those born." In a little village in which the author lived for several years, an investigation, made with the help of some Christians, showed that without exception women who had given birth to two children had killed at least one of them.

In Tahiti two-thirds of new-born children are killed, those of the female sex making up the greater part of the numbers. The first three infants and all twins are killed, and as a rule not more than two or at most three are actually reared.† Among the Melanesians the custom of infanticide is very common. "It must also be assumed," said Ratzel,‡ "that in Ugi (Solomon Islands) all the infants are killed, to be replaced by the Bauros."

It is not surprising that such a widespread occurrence of artificial abortion and of infanticide among primitive races is bringing about a rapid diminution in the numbers of these, and may lead even to their extinction. This is taking place in the case of the natives of New South Wales, of New Guinea, and of the islands of Aaru. Nothing could show more plainly the feebleness of the human family instinct.

---

* "L'Anthropologie," vol. IV., p. 129, 1893.

† Waitz-Gerland, "Anthropologie der Naturvölker," vol. VI., p. 139, 1872.

‡ "Völkerkunde," vol. I. p. 274, 1885.

In more highly civilised nations, the rude proceedings of savages have been replaced by clever devices to prevent conception, and infanticide has become rare. Artificial abortion is excited by modern methods suggested by the progress of science. The embryonic membranes are pierced not by the ribs of seals or hair-pins, but by sterilised sounds, and the operation is performed with strict asepsis. In averting the natural results of passion the woman is subjected to the smallest possible risk.

It is indubitable that more than one race has perished because of its lack of the instinct of family. However, it need not be feared that the human race itself will disappear because of the failure of procreation. But it is plain that the readiness with which devices to prevent the production of children have been adopted shows the weakness of the family instinct in man, and opens up a problem to which the attention of moralists and legislators may well be directed.

The family instinct is deeply seated, as it arose among animals more ancient than man; none the less it exhibits disturbances and aberrations in the human race capable of bringing about the extinction of peoples or nations. It is, however, strong enough to secure that man will persist in the future.

Man certainly is a social animal, but the instinct impelling him towards union with his fellows is of recent origin. Such animal societies as are to be found among insects are not comparable with human associations. Among mammals, the nearest allies of man, the social instincts are developed only to a slight extent, and even the anthropoid apes show very little progress in this direction. Many of these creatures have shown in captivity the aptitude to become friendly with man or with other animals, and thus have displayed the beginnings of the capacity to form societies. But, in the wild condition, anthropoids live only in families, and these contain few individuals. As regards the social capacities of the chimpanzee Dr. Savage wrote : * "They cannot be called gregarious, seldom more than five, or ten at most, being found together. It has been said on good authority that they occasionally assemble in large numbers in gambols. My informant asserts that he saw once not less than fifty so engaged ; hooting, screaming, and drumming with sticks on old logs, which is done in the latter case with equal facility by the four extremities."

We have little acquaintance with the social life of the anthropoids, but, so far as we know, these creatures present only the merest beginnings of the social instinct. Man has moved much beyond them in that direction. Even the lowest races and the most primitive of living peoples such as, for instance, the Bushmen or the aborigines of Australia, display a well-developed social instinct.†

The universal presence of the social instinct among human beings would seem to afford the basis of a happy life. In the numerous attempts made to find a purely rational principle that may serve as the basis for morality without the intervention of supernatural sanction, abundant use has been made of man's craving to live in association with his fellows. Those who have tried to deduce moral law from the essential constitution of man have relied largely upon the innate sympathy between man and his fellows. Such a line of argument is so common and has been employed so frequently that I need not spend much space in developing it. I shall limit myself to a few examples.

Towards the end of last century Büchner,‡ a German

---

* Huxley, "Man's Place in Nature," p. 60.

† Sutherland, "Origin and Development of the Moral Instinct."

‡ Büchner, "Force and Matter."

physician, published a materialistic code of morality that made a considerable sensation. He wrote as follows on the question now before us: "What we term the moral sense arose from the social instincts and habits which, under pain of extinction, are developed in every society of men and animals. Morality depends on sociability, and varies with the peculiar conditions of each particular association. As man is essentially a social animal, and to be regarded, apart from society, merely as a wild beast, it is plain that the needs of the community must impose on him certain restrictions and directions that in time will pass into a settled code of morals."

Half a century later practically the same idea was repeated. Haeckel,* the well-known German naturalist, expressed it as follows in a volume that appeared a few years ago:—

"Modern science shows that the feeling of duty does not rest on an illusory 'categorical imperative,' but on the solid ground of social instinct, as we find it in the case of all the social animals. It regards as the highest aim of all morality the re-establishment of a sound harmony between egoism and altruism, between self-love and the love of one's neighbour. . . . If a man desire to have the advantage of living in an organised community he has to consult not only his own fortune but also that of the society and of the 'neighbours' who form the society. He must realise that its prosperity is his own prosperity, and that it cannot suffer without his own injury. This fundamental law of society is so simple and so inevitable that one cannot understand how it can be contradicted in theory or in practice; and yet that is done to-day and has been done for thousands of years."

---

* Haeckel, "The Riddle of the Universe," pp. 357–358, Second Edition, 1901.

The sexual and family instincts may be satisfied in many different ways, and this is also the case with the social instincts. Onanism and perverted passion may satisfy the sexual instinct; celibacy, artificial abortion and infanticide exist alongside the love of the wife and the parental cares. ✓ So also the social instinct of a criminal may be satisfied by his association with other criminals.✓ It is well known that the most hardened criminals have their own codes, and they join faithfulness to their own companions to an atrocious attitude towards the rest of the world.

It is not enough then merely to give scope to the social instincts that we all possess. We have to determine how far, and towards which of our fellow creatures, we are to exercise such instincts, and it is here that the difficulty arises which as yet has not been resolved by religion or rationalism. Must our social instincts reach to our relatives near or distant, or to our fellow townsmen, or compatriots, or to all white men, or to all men, white and black, or to the good only, or to the good and bad alike? Perhaps we should limit the operation of the instinct to those of our own religion, or who share our views of life? The instinctive feeling is quite silent on these points, and it is precisely on them that the difficulties arise. It is well known that at different epochs and in different circumstances very different answers have been given to such questions. When religion was predominant, a common faith was a bond transcending patriotism. Later on, patriotism itself became the dominant bond. In recent days, a conception of international solidarity began to appear. Thus, for instance, there was recently a combination of different nations against China, and nationality was forgotten. Some of the European nations banded themselves together and even assumed an Asiatic race in the union, with the object of punishing a common enemy.

What was the bond that united nations so different? It was not religion, for the bond included Catholics and Protestants, orthodox Christians and Buddhists. Most probably the bond of union was a community of interest, the result of similar civilisation and military and political organisation.

It has been suggested occasionally that the social instinct, or human sympathy, for the terms are practically identical, may stretch further and further and become so widespread that all the members of the human stock will unite and act only for the common good. But the problem is complex. Sympathy, when pushed too far, may become harmful. Nations have taken part in a campaign, impelled by some feeling of sympathy, and have brought harm on themselves. Sympathy extended to criminals and wicked persons is equally harmful. The social instinct itself must be regulated for the good of the community which it holds together.

Ought we to extend our sympathy to all humanity, or to limit it to some particular section? Theorists have spoken of the solidarity of all humanity, believing it possible to extend our sympathy to the races furthest removed from us. In countries in which different races are brought in contact, very practical difficulties are encountered by the theorists. In America and in some other countries, for instance, laws have been passed against the Chinese, excluding the latter from the consideration granted to other races. The negro question also is very difficult in those countries in which the black race dwells amongst whites. In Europe it has been the custom to condemn the action of civilised races in taking their land from natives of primitive type. Sutherland, the author of a striking work on the origin and development of morality, justifies such arbitrary conduct.

To the question, "Was it right for the whites to take possession of the Australian forests of the blacks?" he replied in the affirmative. "No doubt," he said, "there is a moral instinct against it, but the action undoubtedly was right." * In a summary of his conclusions he lays down that moral conduct is a compromise between the individual and social instincts that so often are opposed. But he has no more to say than his predecessors as to the rational basis of the compromise.

The social instinct has been acquired by mankind too recently, and it is still too feeble, to be a trustworthy guide in all conduct. To obviate this difficulty, at many different times, divine sanction has been evoked to control the relations among men. The categorical law has been formulated with the same object. Thus by one means or another, some kind of social order has been kept up. The efficacy of these additional guides is seen clearly on those rare occasions when some special combination of circumstances has set people free from them. Thus at Moscow, in 1812, before the arrival of the French army restored authority, and lately, after the eruption in Martinique, the ordinary authority lapsed, the anti-social instincts of the people were loose, and a clear idea was given of the inherent weakness of the human social instinct.

I have shown that in man the instinct for choosing food and the sexual and social instincts are still so weak that it is impossible to trust to them in the absence of other guidance. It is as equally necessary to determine what kind of food is most suitable for men in different conditions of life, and what means are best fitted to satisfy rationally his sexual and family instincts. So also it is urgent to determine exactly the direction and object of the social instinct. For

---

* *Loc. cit.* p. 796.

the love of our fellow creatures we should seek the best ways of making them happy.

But what is happiness? Is it the feeling of well-being experienced by the individual himself, or is it the judgment of others on his sensations? It is notoriously difficult to pronounce on the happiness of another. From the outside, when a man seems to enjoy health, to have a family and comfortable means of subsistence, we are inclined to call him happy; but the individual himself may have a very different opinion about himself. It is often impossible to rely on the judgment of others. On the other hand, the opinion of an individual himself on his own condition may be equally fallacious. Very often the feeling of well-being is a symptom of general paralysis, as may be inferred from the following quotation: "The patient is well pleased with himself, and delighted with his constitution and circumstances. He boasts without ceasing of his robust health, his muscular strength, the clearness of his complexion and of his general 'fitness.' His clothing is magnificent and his residence palatial. In a more advanced stage of the disease, the exaggeration becomes extreme. He believes that he is able to blow down the walls with his breath, or that he could carry a ton, or drink a hogshead of wine, or that nothing could tire him out. Then megalomania begins, and the patients believe themselves in possession of titles, of power, and wealth. They are members of parliament, noblemen, princes, generals, kings, emperors, and popes, or God Himself." *

As general paralysis is a result of syphilis, in order to make a large number of persons believe themselves thoroughly

---

* Ballet and Blocq, "Paralysie générale progressive," in "Traité de Médicine," published under the direction of Charcot, Bouchard, and Brissaud, vol. VI., p. 1032, 1894.

happy, it would be necessary only to spread this disease. Without lingering on this paradox, I may at least point out that the problem of happiness, which is associated intimately with social life, is extremely difficult.

The social instinct is equally powerless to solve the problem of justice in its relation to the general interest of humanity. It is plain enough that, in the existing condition of human knowledge, we all inflict and undergo injustices of different degrees. This misfortune is a consequence of the disharmony of human nature.

From what I have already said, it must be clear that before we can find a rational guide to direct us in the operation of our social instinct, we should have to determine exactly the nature of true happiness for the individual and of true justice. Then only should we be in a position to set about making human life as happy as is possible.

CHAPTER VI

DISHARMONIES IN THE INSTINCT OF SELF-PRESERVATION

The instinct of self-preservation in animals—Man's instinctive love of life—Indifference to life during childhood—Bhuddist legend on instinctive self-preservation and the fear of death—Fear of death treated in literature—Confessions of Tolstoi regarding the fear of death—Other opinions on the subject—The fear of death an instinctive phenomenon—Development in man of a love of life—Treatment of the aged—Murder of old people—Suicide of old men—Absence of harmony between the love of life and the conditions of human existence—The part played by the fear of death in religions and systems of philosophy

It is not to be wondered at that man's social instinct exhibits so many imperfections and disharmonies, seeing that it is still in an unsettled condition, and is a recent acquisition. On the other hand, we should expect to find that love of life and the instinct of self-preservation had reached a high degree of harmony, since these have been in process of development throughout the whole animal series that culminated in man. Even in the lowest forms of life many contrivances exist for purposes of protection. Creatures, the bodies of which are merely microscopic drops of protoplasm, the living material, may be protected by shells from external influences which threaten their destruction. Plants protect themselves, sometimes by means of thorns which prevent them from being eaten, sometimes by secretions either merely irritant in character or actually poisonous. Among animals the means employed for self-preservation are even more numerous. Shields and shells, the secretion of fluids exhaling unpleasant odours, or facilitating escape by clouding the water, as in the case of the ink of the cuttlefish, offensive weapons, strong teeth, and many other characters, serve no other purpose than to protect the individual life. The exposition of this subject would involve writing a complete treatise on the comparative anatomy of plants and animals.

Among lower animals the preservation of life is accomplished without mental connivance, conscious or unconscious. Soon, however, protective instincts begin to appear. Simple cases of these are flight at the approach of danger, protection by a covering of slimy froth secreted by the creatures themselves, or built up from this excreta, or from foreign matter. Such facts show that the love of life and the instinct of self-preservation are almost universal in the living world.

All these devices for the avoidance of danger and escape from death could have been developed in animals before these had any distinct idea as to what death was. We know that some animals can distinguish between living and dead prey. Some carnivora recognise the smell of dead bodies. Those which are accustomed to feed on living creatures refuse all others, detecting the difference by the absence of movement. As in such cases the idea of death is imperfect, it is easy to deceive the creatures by offering carcases artificially set in motion, or living prey rendered motionless by some means or other. In order to escape from enemies so readily imposed upon, many insects when alarmed become motionless and feign death; and that may be regarded as yet another instance in the category of natural means for the protection of individual life.

Moreover, the higher animals, such as mammals, exhibit a profound ignorance of death, many of them remaining completely undisturbed in the presence of dead companions, or even devouring the latter at the risk of contracting a fatal disease. Rats, for instance, eat the bodies of rats which have died of plague, and while appeasing their hunger themselves contract the disease which they transmit to other animals, particularly to human beings. Unlike those animals, however, which are indifferent to the death of their kind, there are others that instinctively shrink at seeing the dead bodies of their own species. Horses on passing a dead horse show signs of discomfort, and attempt to run away. Bullocks when witnessing the slaughter of others also exhibit evidences of distress and fear. In spite of these examples, however, it is quite certain that animals, even those highest in the scale of life, are unconscious of the inevitability of death, and of the ultimate fate of all living things. This knowledge is a human acquisition.

In man, the instinct of self-preservation is well developed. Hardly appreciable during infancy, it manifests itself in a marked degree in young children. At the sight of a human corpse, children become panic-stricken, as though confronted by a wild beast or snake.

In young adults this instinct of self-preservation, which is closely connected with an instinctive fear of death, is not fully developed. It often takes some special circumstance to awaken it, such as a dangerous illness, an accident, or the perils of war. Young people who while in good health believe their lives to be in danger, often take it to heart so as to make themselves really ill. Relating his impressions during the siege of Sebastopool, Tolstoi, who at that time was only twenty-six years of age, writes as follows: "Notwithstanding the distractions offered by various and urgent duties, the instinct of self-preservation, and the longing to quit this horrible place of death was present in the hearts of all. This desire was equally strong in all; in those mortally wounded, and in the volunteer rushing with all his might into the centre of the fray to open a path for the horse of the general, in the general himself as he directed and controlled his men. The officer of marines, in the middle of a battalion in action, crushed so that he could hardly breathe, felt it equally with the wounded man carried on a stretcher by four soldiers until, further progress being impossible, he had been set down just under the Nicolai battery, or the artilleryman who had served his gun for sixteen years."✓ In the normal course of life, however, the young do not show an instinctive clinging to life in any marked degree.✓ They often risk their lives for trifling reasons, and commit all sorts of indiscretions hurtful to life or health without a thought of the consequences. They may be inspired by the highest motives, but they are equally ready to fritter strength away in the gratification of the lowest appetites. Youth is the age of disinterested sacrifice, but also of indulgence in all kinds of excesses, alcoholic, sexual and others. Youths seem to think that they will always attach the same value to life, and that between death at thirty years of age and death at sixty, there is a difference only of time. ✓As their love of life is indifferently developed, young people are often extremely exacting, the pleasure they enjoy being but moderate, whilst the suffering provoked in them by the slightest annoyance is intense. They consequently become epicureans in the lowest sense of the word, or else abandon themselves to exaggerated pessimism. ✓

"Edite, bibite, post mortem nulla voluptas" was the motto of German students, greedy for pleasure, and unknowing that a love of life develops with age in every human being. On the other hand, in order to keep the balance between joy and sorrow, youth, true to its instincts, undervalues the former and exaggerates the latter, thus arriving at a pessimistic view of life, and declaring that existence is a misfortune in itself. It is significant that Schopenhauer published his theory of pessimism at the age of thirty-one. His successor, R. Hartmann, when twenty-six years old, proclaimed that human existence is an evil which one should get rid of at all costs. Optimistic theories, on the other hand, have been set forth either by persons advanced in years or by persons whom special circumstances have caused to appreciate the joy of living. As a counterbalance to the pessimism of German philosophers, Duhring formulated a theory of optimism in his book "Der Werk des Lebens," but was himself blind at the time. Sir John Lubbock published some years ago a book entitled "The Pleasures of Life," which opens with the following sentence: "Life is a great gift." His attitude towards life is entirely opposed to that of the pessimists, but then he formulated it at the age of fifty-three.

It has long been recognised that the old attach a higher value to life than do the young. J. J. Rousseau, for instance, says: "Life becomes dearer to us as its joys pass away. The old cling to it more closely than the young." *

This reflection is absolutely correct, and is proved by a number of facts. I once knew very intimately a scientific man who had passed a very unhappy youth. Being hypersensitive to pain, he tried to assuage it by every means in his power. Some trifling annoyance sufficing to throw him into a state of utter prostration, he was in the habit of

* Emile, "Œuvres complètes de J. J. Rousseau," vol. II., p. 432, 1876.

resorting to the aid of narcotics. In order to escape from mental anguish he inoculated himself with poisons. By the time he had arrived at an advanced age his hypersensitiveness gave place to feelings much less acute. He ceased to resent the ills of life so bitterly as he did in his youth; while he came to appreciate better the positive side of life, and even in moments of unhappiness he did not contemplate putting an end to his existence.

In youth he was pessimistic, and insisted upon the preponderance of evil over good. As he became older, his attitude towards existence became entirely modified.

I do not say, however, that it is necessary to be old in order to realise the misfortune of death. "He who pretends to face death without fear is a liar," said J. J. Rousseau. "That all men fear to die is the great law dominating the thinking world, and without which all living things would soon cease to exist. This fear is a natural impulse, and is not merely an accident but an important factor in the whole order of things." *

One often hears people express their indifference to death, but an examination into their real feelings on the subject soon shows the true state of affairs. I once happened to be present when a lady, already well advanced in years, expressed a wish for death, and said that she had no fear of it whatever. On acquiring a fuller knowledge of her case, I recognised that she was seriously ill, and that she regarded death as the only possible termination to her sufferings. As soon as she found that recovery was possible, she manifested intense delight at the prospect of a prolonged life freed from incessant pain.

Instinctive love of life, and fear of death, which is only a manifestation of the former, are of an importance in the

---

* *Loc. cit.* p. 76.

study of human nature impossible to over-estimate; it is therefore necessary to consider a few instances throwing light upon the subject. Even the ancients were interested in the problem. The subject is perhaps as well dealt with in a Buddhist legend as anywhere.* "The young Prince Çakya-Mouni, the founder of the Bhuddhist faith, being desirous of discovering the true meaning of life, expressed a wish to leave the world and devote himself to a religious life. In order to turn him from his purpose, his father built him a magnificent palace, wherein he could indulge in every sort of pleasure, and in which he would be protected from all sorrow. Under this system he never saw old people, nor those who were diseased, nor the dead. In spite of being thus strictly guarded, the young prince often contrived to escape into the outer world in order to drive about. During his first drive, he met a broken-down, decrepid old man, with varicose veins, decayed teeth, a wrinkled skin, and grey hair, bent double with age like the roof of a house, leaning upon a stick; all traces of youth had departed from him, only inarticulate words came from his throat, his procumbent body resting on the stick, and his limbs and every part of them trembling." Having learnt from his coachman that this was an old man, and that "in all living creatures age creeps upon youth," that every one came to it and that "there was no way out of it," the prince was so deeply impressed that he said to his coachman, "What a misfortune to be a weak foolish person, whose intelligence, blinded by the pride of youth, sees nothing of old age. Turn round my chariot. I would return. What are games and pleasures to me whose body is the future dwelling-place of old age?" Another time Çakya-Mouni met on the road a man consumed by fever, his body weakened, his breathing difficult. Informed by his coachman that the man was suffering from disease, the young prince exclaimed: "Health, then, is a mere dream, and the fear of disease takes a terrible form. What wise man, having seen such a phase of human existence, could continue to be gay and happy?" Shortly after Çakya-Mouni went out for the third time, and "saw a dead man placed on a bier covered by a pall, surrounded by his relations, all weeping, lamenting, wailing, their hair disordered, placing dust upon their heads, and beating their breasts." The violent emotion produced by the sight of the dead man caused the prince to say to himself: "Woe to youth threatened with old age! Woe to health, the prey of every kind of disease! Woe to the life of man which lasts but a little while! Woe to the attractions of pleasure which seduce the hearts of the wise." These reflections of Çakya-Mouni are the basis upon which Bhuddism is founded, and that religious philosophy is impregnated with pessimistic doctrines relating to human life.

---

* The "Lalita Vistara," pp. 166–170.

Modern pessimists hold views resembling Bhuddism. Schopenhauer from early youth was engrossed by the great problems of human life. His mother, in a letter to him* reproached him with "grumbling at the inevitable," which shows that at twenty-seven years of age he had revolted against the idea of death. The problem of mortality was one of those in which he was most deeply interested, and his fear of disease and death was such that he left Berlin at the first outbreak of cholera in 1831 (influenced by the death of Hegel, who succumbed to the disease), and went to live at Frankfort, a town unvisited by the epidemic. He affirms † that "the greatest, and generally speaking the worst, misfortune that can befall any one is to die, and there is no fear equal to the fear of death." It was the impossibility of escape that suggested to him the idea of a pessimistic philosophy.

---

* Edouard Rod, "Les idées morales du temps présent," p. 48, Paris, 1892.

† "Die Welt als Wille und Vorstellung," vol. II., p. 529.

The literatures as well as the philosophies of all periods have dealt with the problem of death. Edmond de Goncourt tells in his "Journal" how, in conversation with his friends, this question was always recurring. The following is an account of one of these conversations:* "Our old established dinner of five took place to-day. Flaubert was missing, so there were only Tourguéneff, Zola, Daudet, and me. The ethical ennui of some of us, the physical sufferings of the others, led the conversation to death, which we discussed until eleven o'clock, sometimes passing to other subjects, but always coming back to the gloomy topic. Daudet declared that in his case it was an obsession, *a poisoning of his life*, and that he never moved into a new house without looking round for the place where his coffin would come to lie. Zola told us that his mother had died at Médan, and that, as the staircase proved too narrow, the coffin had had to be lowered from a window; he declared that he never looked at that window without wondering who would be taken out that way next, he or his wife. "Yes," he said, "ever since that day death has always been in the background of our thoughts, and very often during the night, looking at my sleepless wife, I feel that like me she is thinking of it, and we lie quietly without saying aloud what is in our minds—for shame, yes, for very shame—*Oh! it is terrible, that thought—and the terror of it becomes visible!* There have been nights when I have leapt suddenly out of bed, and held myself for a second or two in a state of abject terror."

---

* "Journal de Goncourt," vol. VI., p. 186, 1878–1884, 1892.

Jean Finot [*] was told in confidence by E. de Goncourt that if he could banish the thought of death from his mind life would be relieved of an almost intolerable burden. Jean Finot also relates that in the course of a memorable evening spent with Victor Hugo at the house of the latter, nearly all of the distinguished persons who were present, when questioned as to their ideas on the subject of death, frankly admitted that the thought of it inspired them with fear and sadness. Amongst modern authors Count Léon Tolstoi has dealt most with the problem of death. In many of his works whole pages of memorable reflections on the subject are to be found, but the most harrowing and terrible picture he ever painted is contained in his "Confessions." [†] The reader will pardon my propensity for quoting passages relating to death. He will recall the account of the Siege of Sebastopol already quoted by me, in which every one was described as fearing death when faced by danger; but this fear, as the author was a young man of twenty-six, was not wholly absorbing.

Shortly before he attained his fiftieth year, Tolstoi became bitterly tormented by the thought of death. He describes the beginning of this mental crisis in the following words: "First there came moments of perplexity, of arrest of vital force, as though I had lost the power of living and moving; I felt utterly lost, and fell into a state of complete dejection. This passed away, however, and I continued to live on as before. Before long the moments of perplexity became more frequent; the arrest of my living energies was always manifested by a renewal of the same questions, 'Why? and What comes after?'" [‡] For some time Tolstoi did not pay much attention to his mental condition, but by degrees he began to analyse it, and reached the following conclusion: "The fact is that life is a blind alley. I had lived, worked and marched onward, and had arrived at the edge of an abyss, and nothing remained to me but to fall into it. And yet I could neither stop nor retrace my footsteps, nor shut my eyes in order not to see suffering and inevitable death. It was a void, a complete annihilation."* "In this condition I felt that I must cease to live, and, fearing death, I had to employ various ruses to prevent myself from taking my life."† "I could attach no reasonable meaning to any action of my life. I was merely astonished to think I had failed to realise the position from the beginning. All that, I said to myself, must have been patent to all the world long ago. If not to-day, then to-morrow, disease and death—they are already here—will attack elderly persons—me—and there will remain only corruption and worms. My deeds, whatever they may be, will be forgotten sooner or later, and I shall be no more. Why then take pains about anything? How a man can know all this and yet go on living amazes me. One can only go on living just so long as one is intoxicated with life; once sober, however, one cannot fail to see what an idiotic fraud it all is. It is also true that there is nothing even amusing or intelligent about it; it is simply stupid and cruel and nothing more." Seeing no way out of this, Tolstoi turned his reflections on family love: "My family . . . I say to myself . . . but then my family, my wife, and children are also merely human beings! They live under the same conditions as I myself. They have the choice between living a lie or facing the horrible truth. Why then should they live at all? Why should I love, cherish, and protect them? In order that

---

[*] "La Philosophie de la Longévité," p. 209, Paris, 1900.

[†] "Les Confessions," Paris, 1891.

[‡] *Loc. cit.* p. 41.

* *Loc. cit.* p. 49.

† *Loc. cit.* p. 51.

they may experience the same despair, or that they may go through life like idiots? Loving them, I cannot conceal the truth from them; every step forward in knowledge leads to this truth; and the truth is death."* To conclude this series of quotations, which must have given the reader some idea of the love of life and the fear of death, I shall give one more example, taken, not from the pen of a master but from daily life.† It refers to the death in the Christian community of a "minister of God, who was pious as a S. Francis of Assisi, candid as a young girl, of a rigid asceticism, and renowned for his charity." Logically speaking, the death of such a man should have been peaceful. Had he been a fictitious character, his author would not have described his death except in the conventional fashion. This is what really occurred, according to the letters of an intimate friend of the dying man, who wrote as follows: "Our poor friend is fighting death inch by inch in a way that is positively tragic. He who was so full of resignation, so serene, so perfectly at peace with his own soul, *is terrified by the approach of death*. It is a *horrible sight*, that moves one to tears. We are powerless not only to afford him physical relief but to console the terrible anguish which assails the clear intellect that clings so desperately to life, and which death will claim while fully alive. 'I could still,' he cried, 'give a course of lectures on theology or political economy, and I must die . . . It is terrible to be fully conscious . . . How much better it would be if I could not think! . . . And what is it that we ask of God? Eternal happiness! It is just as if one of your workpeople came and asked you for a thousand francs for a day's work! You would answer him, 'What nonsense you talk, you must be mad, my friend!' *It is hard to die.* I confess to you, my friend, that this makes one reconsider religion and philosophy. . . . The goodness of God is not what we think . . . *there is a mystery over us.* . . . Is death then truly the King of Terrors for those who have led good lives?"

---

* *Loc. cit.* p. 60.

† *Union pour l'action morale*, No. 6, p. 258, Jan. 15, 1902.

What is this love of life which makes death so terrible? It is a very interesting question, and Tolstoi himself has published an essay on "the fear of death." *

He tries to prove that the feeling arises from a false conception of life. "Those who fear death," he says, "fear it because it seems an empty darkness, but the darkness and emptiness present themselves merely because they have a false conception of life." † According to Tolstoi man should have no greater fear of death than of any of the other changes to which it is subjected by life. "No one is afraid of falling asleep," he says, "and yet the phenomena of sleep are like those of death—there is the same loss of consciousness. Man does not fear sleep, although the arrest of consciousness is as complete as in death." ‡

Tolstoi thinks that the fear of death is a superstition, and that it disappears when we see life as it is. §

Tokarsky,|| another Russian writer, a few years ago published a treatise on the fear of death, and tried to show how little reason there was for it. The writer was a physician for the insane, and knew himself to be afflicted with an incurable and fatal disease. His observations on the fear of death were probably based on his own feelings.

---

* Complete Works of Tolstoi (in Russian), vol. XII., p. 512, 1897.

† *Loc. cit.* p. 517. ‡ *Loc. cit.* p. 526. § *Loc. cit.* p. 536.

|| "Questions de Philosophie et de Psychologie," 1897, No. 40, p. 931. (In Russian.)

Judging from the evidence of a number of persons who had been in mortal danger, Tokarsky declared that death had no terror, and that it was unnecessary to fear it.

Tokarsky's theory was supported in recent years by Finot * whose arguments in its favour were similar to those of his predecessor. He held that man himself created the fear of death, and that the prospect of an unknown future played a considerable part in it. "Beyond that which we see," says Finot, "there is always something that we cannot see, and it is the invisible that we fear." † The idea that death is generally attended by pain seems to Finot quite erroneous, and he comes to the conclusion that "our ignorances and prejudices are responsible for the creation of this superstition, so terrible to contemplate, so far removed from the truth." ‡ Instances which have occurred of people threatened with death and suddenly restored to life, give proofs, according to Finot, that death, far from being painful, is attended by pleasant sensations. With regard to this, Heim, a Swiss savant, says that tourists who have had serious falls while mountaineering, and have been so near to death that they experienced all the premonitory symptoms, felt above all a sensation of ecstasy.

It cannot be denied that some forms of death are pleasant, but it is no less certain that in many other cases, and these too the majority—the sensation of approaching death is, on the contrary, extremely painful. This question, however, is not necessarily connected with the fear of death that may come to those who are not yet about to die. But it is precisely the latter mode of fear that is so important a factor in human life. Men who are dying of starvation do not feel painfully hungry at the moment of death. The

---

* "La Philosophie de la Longevité," Paris, 1900.

† *Loc. cit.* p. 211.

‡ *Loc. cit.* p. 213.

actual pain of hunger lasts only for a limited period, probably, in the case of man, only about twenty hours, after which it is succeeded by a condition of lassitude and general weakness, which however is different from painful hunger. The fear of death is similar, for in certain cases it does not last up to the end of life. The pain of thirst, on the other hand, is much more persistent, lasting up to the end.

Finot discussed the instinctiveness of the fear of death. "The question," he wrote, "is important. For if the fear be instinctive, it is independent of our will and not to be controlled by reason. It would then break out in every case at the approach of death. Now the evidence of many persons who have no more than escaped mortal danger is clearly against the view." * Hunger is certainly instinctive, and yet is not always felt when the body is exhausted by want of food or menaced by death from starvation.

Closer investigation leaves no doubt but that the fear of death is truly an instinct. In some of the higher animals it exhibits itself in the same fashion as other instincts. The intimate friend, whom I have already mentioned, was for years in constant expectation of death, and faced its approach with perfect calmness. Believing that he had played his part in life to the best of his power, not only did he think it quite natural that he should cease to live, but he regarded the possibility of a decrepid and painful old age with the greatest possible repugnance. In his case, neither reason nor desire led to a fear of death. When, however, it was definitely diagnosed that he suffered from a disease which might prove fatal, there was aroused in him a certain sensation which must have been the fear of death. Analysis of Tolstoi's statements in his "Confessions" makes it clear that his

---

* *Loc. cit.* p. 211.

sensations on reflecting that he too would cease to be, and that there would be left only corruption and worms, were no other than the instinctive fear of death, a fear that his reason was powerless to control. To follow Tolstoi in telling any one that the fear of death is a form of superstition which must be subdued by the intelligence, is no better than to attempt to console a woman about to undergo ovariotomy by telling her that as in future she will be unable to bear children she ought to subdue her sexual instincts. She will find out that her desire is not under control of the will but is a pure instinct.

The fear of death has long been recognised as an instinct. Schopenhauer,* for instance, interpreted it in that way. According to him, " from the point of view of intelligence there is no ground for fearing death. Reason, which is the outcome of knowledge, does not present death to us as an evil. It is certainly not the rational, conscious part of ourselves which fears death ; the *fuga mortis* which pervades all living beings is an emanation of the blind will." This " blind will " is no other than a pure instinct which is independent of our rational will.

I need not pursue the subject, but I may recall that Lord Byron came to the conclusion that the fear of death is an instinctive manifestation of the soul. In " Cain " he expressed this view sufficiently clearly :—

> I live,
> But live to die ; and living, see nothing
> To make death hateful, save an *innate clinging,*
> A loathsome, and yet all *invincible*
> *Instinct of life,* which I abhor, as I
> Despise myself, yet cannot overcome—
> And so I live.

---

* " Die Welt als Wille und Vorstellung," vol. II., p. 533.

Later on in the same poem Byron makes Cain say of his father Adam :—

> Ere he plucked
> The knowledge, he was ignorant of death.
> Alas, I scarcely now know what it is ;
> And yet I fear it, fear I know not what.

It is then indubitable that among the instincts of man there is one which loves life and fears death. This instinct develops slowly and progressively with age. In that respect it is astonishingly different from other instincts. When hunger or thirst or sexual desire is gratified a sensation of satisfaction is experienced, and this readily passes into satiety or even indifference. The mood lasts for a certain time, and then the instinctive needs reawaken. The instinct of life, however, behaves very differently. In most human beings it develops slowly and becomes stronger and stronger as the years pass by. In childhood and early youth we are very anxious to "grow up," but when we are adult we have no desire to grow old. We are greatly disturbed by the appearance of wrinkles and grey hair. Instead of being glad to have finished a great part of our mortal career, we feel sad at being nearer the inevitable end. Old age, as it usually presents itself, is marked by ugly features, and often by repugnant or even horrible characters. Little children are usually terrified by the appearance of very old persons, and it is a familiar nursery threat to send for an old man.

The murder of the aged is a custom widespread amongst the lower races. The natives of Fiji bury their old men alive, on the pretext that they have become utterly useless. The custom is in existence throughout Melanesia, and occurs in New Caledonia and in most of the adjacent Polynesian islands. Old age is universally despised in that part of the world. The natives of Australia respect old people so long as they retain their activity, but once they become unable to take care of themselves they are abandoned. Often they are killed and eaten, and this custom is favoured by their religious beliefs.* The ancient inhabitants of Germany, according to the investigations of Grimm, "killed the old and the sick, and often buried them alive."

The modern civilised world has certainly made considerable progress. The old are no longer killed; they are tolerated, and accorded liberty to commit suicide. In many countries work is often refused to the old on the plea that they are not strong enough for it, and at the same time they are refused admission to almshouses on the pretext that they are not yet old enough. Dealing with the question of the average life and of the normal life, Paul Bert † expressed himself with regard to the aged as follows: "They deserve congratulations, care and consideration, *but the prolongation of their lives does not demand any special solicitude from society*."

However, in spite of the characters of old age which make it horrible and useless, and at best no more than to be tolerated, and in spite of the physical and intellectual weakness that accompany it, the instinctive love of life is preserved in the aged in its strongest form. To make quite certain about this I have visited almshouses for the aged, and it was easy to see that all the inmates hoped that their days might be prolonged. In a Home occupied by fairly well-educated persons, I discovered that one and all felt as if they were continually being threatened by death, as if they were convicts awaiting the day of execution. At the Salpêtrière, where there are a number of very old women, septuagenarians are regarded almost as young girls. The great ambition of women of eighty is to live to one hundred, and the desire to live is almost universal.

---

* Waitz-Gerland, "Anthropologie der Naturvölker," vol. VI.

† These words are quoted by Ebstein in his "Die Kunst das menschliche Leben zu verlängern," p. 51, 1891. I have been unable to find Paul Bert's own words, as the reference given by Ebstein is bibliographically incorrect.

This seems a contradiction of another fact demonstrated by statistics, that age increases the frequency of suicide. It is certain that more old men commit suicide than young men, but on careful inquiry into the statistics of the subject, it becomes evident that the chief incentive to suicide does not lie in the cessation of the will to live, but in the difficulties experienced by old people of earning a living, and in the frequent presence of disease in the aged. Deprived of the means of existence, refused the shelter of charitable institutions, old men are apt to fall back upon a rope or the fumes of charcoal. Statistics relating to the suicide of the aged show that the greatest number of victims belong to the poorer classes. The suicide of rich old men is generally prompted by the presence of incurable disease. There is, however, need for much wider inquiry into the subject. It would be interesting, for instance, to obtain more detailed information regarding the motives which urge the old to put an end to themselves. In recent times the suicide of Max von Pettenkofer aroused public attention. After a distinguished scientific career, he resigned his post of Professor at the University of Munich at the age of seventy-six. He went to live a little way outside the town on a property where he devoted himself to gardening and other country pursuits. Although a sufferer from diabetes, his intellect remained unimpaired, but he became a prey to extreme melancholy, owing to the death of some friends to whom he was greatly attached. Moreover, during the latter part of his life he suffered from a septic affection of the neck. This disease, not fatal in itself, was the indirect cause of Pettenkofer's death, which occurred by suicide at the age of eighty-three. The *post-mortem* examination * showed a fairly well preserved organic system, healthy, with the exception of chronic inflammation of the membranes of the brain and atheroma of the cerebral arteries. The circumstances relating to this particular case of suicide are unusually well known, and yet there are many obscure points about it which are of the highest importance. The chronic meringitis from which the aged scientist suffered conclusively precluded the theory that the motives which led him to commit suicide were prompted by the phenomena of normal life. On the other hand, instances are not wanting of old men of good education and refined surroundings who cling tenaciously to life, even at a much more advanced age than the Munich professor.

The instinctive love of life resembles the sexual instinct in a great many women. Just as the love of life goes on increasing when the best of life is past, sexual pleasure is often unfelt by women until their beauty is already faded.

Another character common to the love of life and the sexual instinct is that they both persist throughout old age, although they can no longer be satisfied.

Edmond de Goncourt relates in his diary that at his réunions of literary celebrities (Zola, Daudet, and Tourgéneff), the conversation turned most frequently upon the subjects of love, life and women. "Death or love, strangely enough," says Edmond de Goncourt, " are always what we talk about after dinner." † Old age was even then knocking at the doors of the distinguished writers mentioned, and so it is quite natural that their interest should have been wholly absorbed by the two instincts which exhibit such enigmatic and paradoxical tenacity.

---

* "Münchener Medicinische Wochenschrift," p. 325, 1901.

† *Loc. cit.* p. 186.

We saw in the preceding chapter how disharmonious is the sexual instinct which often only develops at, and nearly always persists until, a period of life when its normal and regular functional activity is no longer possible. We saw, too, the ill resulting from this disharmony in the reproductive apparatus. The ill, however, although serious, only amounts in that case to an inconvenience which can be endured.

Far worse is the disharmony of the instinctive love of life which manifests itself when death is felt to be near at hand. It is then incomprehensible and particularly terrible, and humanity, from time immemorial, has sought the key to the tragic puzzle, and tried by all the means in its power to unravel the mystery. The religions of all times have been concerned with the problem. "Religion," says Guyau,* "consists for the most part of meditation upon death. If we had not to die there would probably be still more superstitions among men, but there would probably be no systematised superstitions nor religions." Philosophy also has tried to solve the question of death. Some ancient philosophers held the opinion that philosophy is only a meditation upon death. Socrates and Cicero † have well said that "the life of a philosopher is a continual meditation upon death." In our own day Schopenhauer developed the same theory. "Death," he said,‡ "is the real inspiring genius of philosophy. . . . Without death it is doubtful if philosophy would exist at all. It is therefore quite natural that a special essay on Death should preface the last, the most serious, and the most important of my books."

---

* "L'Irreligion de l'Avenir," Sixth Edition, p. 449, Paris, 1895.

† "Tusculanes," vol. I., chap. 30.

‡ "Die Welt als Wille und Verstellung," vol. II., p. 527.

Judging from the facts set forth in the last three chapters, there can be no doubt but that the human constitution, although in many ways perfect and sublime, exhibits numerous and serious disharmonies, which are the source of all our troubles. Not being so well adapted to the conditions of life as orchids are, for example, in the matter of their fertilisation by the mediation of insects, or the burrowing wasps for the protection of their young, humanity resembles rather those insects the instinct of which guides them towards the flame which burns their wings.

Even at a time when humanity had attained no definite knowledge of itself, a vague suspicion prevailed as to the existence of disharmonies, and an effort was made to remedy the evil. The following chapters will show what man has done with a view to remedying the natural disharmonies of his constitution.

PART II

ATTEMPTS TO DIMINISH THE ILLS ARISING FROM THE DISHARMONIES OF THE HUMAN CONSTITUTION

(RELIGIOUS AND PHILOSOPHICAL SYSTEMS)

CHAPTER VII

RELIGIOUS ATTEMPTS TO COMBAT THE ILLS ARISING FROM THE DISHARMONIES OF THE HUMAN CONSTITUTION

Animism as the foundation of primitive religions—The Jewish religion in relation to the doctrine of immortality of the soul—The religions of China—Ancestor worship in Confucianism—The conception of immortality in Taoism—The persistence of the soul in the Buddhist religion—The paradise of the Chinese Buddhists—Ancestors worshipped as gods—Influence of religious faith on the fear of death—Pessimism of the doctrine of Buddha—The meaning of Nirvâna—Resignation as preached by Buddha—Objections to the immortality of the soul--Irritability of the tissues and cells of the body—Religious hygiene—Religious means of controlling the reproductive functions and of preventing diseases—Failure of religions in their attempts to combat the ills arising from the disharmonies of the human constitution

HUMANITY did not await the discovery by science of the existence of disharmonies before trying to find remedies for them. The will to live, to preserve health, to satisfy the instincts and to make them act in unison, have driven mankind, in the very earliest days of reflection, to invent remedies for the imperfection of the human constitution.

I have shown that, even in the case of animals, the instinct as to choice of food does not save them from certain harmful substances. Man himself has for long recognised that this instinct of his is no safe guide, and has tried to discover surer methods of distinguishing between substances that are useful as foods and substances that may cause disease or death. The best wisdom of primitive man must have been given to the observation of the effects of substances which had been eaten, and to a consequent framing of dietary rules.

The reproductive functions, in the same way, must have attracted the notice of man in very early times, as he must have found the harm that came from a blind following of instinctive desire.

Above all other reasons, man must have been impelled by his instinctive love of life and fear of death to find some way out of his dangerous situation. To preserve his life, man must have sought wise choice of food and control of sexuality.

√ Since the dawn of intelligence, man has tried to judge the unknown from the analogies given by what he knows best, that is to say, by his own self. Thus he came to attribute to everything around him qualities like his own qualities, and motives like his own motives. He came to think not only that all living beings were possessed of will and intelligence, but that inanimate things conducted themselves like human beings.

Such a primitive idea is the basis of what Tylor has called "Animism," the foundation of the philosophy and religion of savage and civilised man alike. When a man was seen to die, it was plain that he did not entirely disappear, but merely became transformed into a new condition. The dead body was not alive as we are, but, none the less, it was alive in a fashion of its own. This was the answer to the desire for the preservation of life, to the fear of death, that is to say, of total extinction. It is practically identical with faith in immortality and a future life.

The animistic conception is almost world wide. It is plain that it afforded the most efficacious palliative for minds revolting against the inevitability of death, and that it harmonised with our intense will to live. "Such child-like ignoring of death," wrote Tylor,* "such child-like make-believe, that the dead can still do as heretofore, may well have led the savage to bury with his kinsman the weapons, clothes, and ornaments that he used in life, to try to feed the corpse, to put a cigar in the mouth of the skull before its final burial, to lay playthings in the infant's grave. But one thought beyond would carry this dim blind fancy into the range of logical reasoning. Granted that the man is dead, and his soul gone out of him, then the way to provide that departed soul with food or clothes or weapons is to bury or burn them with the body."

It is needless to recapitulate the various animistic customs which were in vogue among primitive peoples, and which have left marked traces amongst nearly if not all civilised races. The details may be found in the works of several authors, notably Tylor, Lubbock, and Waitz-Gerland.† I shall mention only a few, choosing those that seem most plain. The Turanians of Eastern Asia bury with their dead all sorts of implements, such as axes and flints, and food, such as meat and butter, believing that the departed will have need of these during the long voyage in the land of the spirits. A Tasmanian, on being asked why spears were buried with the dead, replied, as if the answer were self-evident, "Of course for the use in combat of him who has fallen asleep." The Greenlanders place bows and other weapons in the tombs of their men, and knives, needles, and other instruments for sewing are buried with their women, in the full belief that such objects will be useful in the other world. In the Congo region, the curious custom exists of leaving a hole in the grave over the mouth of the dead body, and once a month passing into this hole meat and drink.

---

* Tylor. "Primitive Culture," vol. I., p. 485. Third Edition, 1891.

† Waitz-Gerland. "Anthropologie der Naturvölker," 6 vols., 1866–1872.

Many races are not content to place merely inanimate objects in the graves. The Caribbeans, believing that the human spirit after death is carried to the kingdom of dead souls, sacrifice slaves on the tombs of their chiefs, in order that the latter may be attended in the next world. With the same object they bury dogs and weapons. The negroes of the Gold Coast, at the funeral of a great man, kill women and slaves that he may be provided for in the next world. Moreover, they bury with him his finest apparel, his gilded fetishes, and corals and pearls, so that the dead man may continue to make use of them.

Tylor states that such animistic conceptions occur amongst all savages without exception. According to Herbert Spencer, if we take groups of the human race, such as tribes, societies, and nations, we find abundant evidence that all, or nearly all, have a belief, vague or clear, in the resurrection of a double of the dead man. It has been suggested that the origin of this widespread belief is the image of the departed that comes to us in dreams. These images are taken as real visits of the dead.

In civilised races there are numerous relics of the old beliefs. The Spaniards set bread and wine on the graves of their relatives on the anniversaries of their deaths. The Bulgarians hold a feast of the dead on Palm Sunday. They eat and drink well, and then leave the remains of the banquet on the graves of their relatives that these may consume them in the night.

Saint-Foix * relates that when Bertrand Duguesclin was buried at St. Denis, in 1389, several horses were sacrificed. The Bishop of Auxerre first blessed them, laying his hands on their heads, and then they were killed. At Treves, in 1781, at the burial of General Frederic Casimir, his horse, according to the custom of the Teutonic Order, was led in front of the bier, and when the General had been laid in the tomb, the horse was killed and buried with him.†

Although the sacrifice of men and animals is no longer made by civilised peoples at burials, many funeral customs have an obviously animistic origin. In Russia, for instance, rice is placed alongside the corpse, and pine branches are strewed along the way to be traversed by the procession. The wreaths of "immortelles," used so largely at funerals by the modern French, have an extremely ancient origin. They were employed by the Romans, and probably their use implied a conception of a future life in a region where plants and flowers grew.

The belief in life after death, so widespread in the world, has been the foundation of all religions. I cannot follow this question here as closely as it deserves. To investigate it elaborately would take more space than this volume affords, and more knowledge than I possess. However, it is important to my argument to insist that, among races that have inhabited very different parts of the earth, that have had very different manners and have passed through different stages of civilisation, the conviction has been strong that death is not the end of all, but only a door leading from one kind of existence to another. Because of the high importance of the existence of this conviction, however, I must

---

* "Essais Historiques sur Paris," in Œuvres Complètes, vol. IV., p. 150. Maestricht, 1778.

† Quoted by Tylor in "Primitive Culture," chap. XI.

discuss some of the criticisms that have been made as to its universality.

It has been asserted repeatedly that the idea of a future life was not a part of the Jewish religion, as formulated in the Bible. Haeckel has recently repeated a common opinion that belief in the immortality of the soul was absent from the oldest and purest form of the Jewish religion. "There is not to be found," he said, "either in the Pentateuch or in those more ancient parts of the Old Testament which were written before the Babylonian captivity, any idea of the persistence of the human soul." This is true only within limits. No doubt the books of Moses contain no reference to a future life nor to heaven and hell in the sense of modern creeds, but it is no less true that the ancient Jews shared with other races the conception of a survival after death. "Like almost all primitive nations," wrote Renan,* "the Hebrews believed in a kind of double personality, in a shadow pale and thin which, after death, descended underground and passed a sad and colourless existence in the sombre halls of the dead. The dead dwelt there, without feeling, or knowledge, or memory, in a world without light, abandoned by God. At the most the old Hebrews hoped to obtain for themselves a quiet resting-place, a pleasant couch for the time when they would be with the dead. It comforted them to picture themselves as lying amongst their ancestors in quiet communion."

Ancestor worship, which is associated closely with the idea of a future life, appears repeatedly in the Pentateuch. Jacob, when he felt death coming upon him, called his son Joseph and said unto him, "Bury me not, I pray thee, in Egypt; but I will lie with my fathers, and thou shalt carry me out of Egypt, and bury me in their burying-place."

* "Histoire du Peuple d'Israël," vol. I., pp. 128–129. 1887.

According to Chantepie de la Saussaye,* "we are coming to recognise more and more how strongly the children of Israel, and in fact all other peoples, were tinged with animism and ancestor worship."

It is very remarkable how the idea of a future life, which was vague in the early days of Israel, grew more and more clear. Ezekiel (sixth century B.C.), when he had "seen the visions of God," prophesied of things to come, and declared that God would breathe life into the dry bones of the dead. The Book of Daniel (second century B.C.) expressed the same idea in a stronger fashion: "And many of them that sleep in the dust of the earth shall awake, some to everlasting life and some to shame and everlasting contempt (Daniel xii. 2). "It is plain," said Renan,† after quoting these words, "that Israel had now reached the last stage in the secular development of her ideas, and had reached the conception of the kingdom of God, as synonymous with the future world and the resurrection. As the conception of a soul distinct from the body was foreign to her, she could not conceive of a future life apart from resurrection of the body."

Still later, in the Talmud, the conception of a future life is clothed with details. Paradise is depicted as a region filled with sweet odours, while hell is an unclean place, thick with mire and smoke. According to the Talmud, in the life beyond the grave, "there is neither eating nor drinking; the good sit there with crowns on their heads and see God in bliss." ‡

At the date of the Cabalistic philosophy, the Jews had embraced the doctrine of transmigration of souls, and had come to believe that the spirit of Adam had entered David and would pass on to the Messiah. Some human souls passed into the bodies of animals, into the leaves of trees, or even into stones.

---

* Lehrbuch der Religionsgeschichte," vol. I., p. 253. Freiburg, Leipzig. Second Edition, 1897.

† "Histoire du Peuple d'Israël," vol. IV., p. 327. 1893.

Talmud. "Traité Bérakhote," sheet 17.

It is plain that the idea of a future life was a part of the Jewish religion.

It has been said, also, that the idea of a future life was absent from the religions of the Chinese. Büchner,* for instance, who came to be almost the official representative of the materialism of the second half of last century, asserts that "Buddhism, that famous religion, the most widespread and one of the most ancient, which counts among its followers nearly a third of the inhabitants of the earth, ignores completely the immortality of the soul." Haeckel, also, in the "Riddle of the Universe," a volume that sums up the materialism of the end of the last century, makes a similar statement. "The higher oriental religions include no belief whatever in the immortality of the soul; it is not found in Buddhism, the religion that dominates 30 per cent. of the entire human race; it is not found in the ancient popular religion of the Chinese, nor in the reformed religion of Confucius which succeeded it." †

This question demands a somewhat closer investigation. It has been thoroughly proved that the basis of the ancient religion of the Chinese was no more than an extreme development of ancestor worship. Every important event in family affairs was accomplished "in the presence of the ancestors." It was a bond with relatives beyond the grave. As in other cases of animism and ancestor-worship, meats were offered to the dead, and objects were buried with them to be of service to them. According to A. Réville,* the Chinese as a whole "fully recognised the conception of personal survival after death; if there were no other reason for stating this, it would be enough to point out that offerings of real food would be incomprehensible, if made to persons supposed to be non-existent or reduced to complete unconsciousness." As they offer to the dead, food and clothing and precious things, it is plain that the Chinese think of life beyond the grave as not very different from this life. "The dead maintain their interest in the affairs and persons and food that was familiar to them."

---

* "Force et Matière." Sixth French edition, p. 439. 1884.

† *Loc. cit.*, p. 198.

As the idea of immortality became developed further, the Chinese modified their customs. Instead of offering to the dead material objects, as is still done by many peoples, they came to substitute emblems. "Houses and clothing and food imitated in paper, and dolls of paper and straw to represent slaves, are burned, so that the spiritual forms of these objects may be offered to the spirit they wish to honour." †

One of the chief motives of ancestor-worship is fear lest the dead, if neglected, may visit their wrath on the living by sending plagues and pestilence upon them.‡

The worship of the dead had laid hold of the Chinese so firmly that even Confucius, notwithstanding his intelligence and scepticism, paid it a large tribute. "Confucius the philosopher," said Réville, "regarded it as a duty to offer to his ancestors the gifts of food that princes had sent to him desiring to honour him." §

---

* "Histoire des Religions," vol. III., "La religion chinoise," Paris, 1889; see also "Chantepie de la Saussaye," *loc. cit.* vol. I., p. 58.

† Réville, *loc. cit.* p. 191.

‡ *Ibid.* p. 195.

§ *Loc. cit.* p. 185.

Confucius and his followers were reticent and ambiguous in their references to a future life, but that attitude did not prevent them from "observing the customs and ceremonies as carefully as if they had had a confident faith in the immortality of the soul." * Although Lao-tseu himself believed neither in heaven nor hell, and professed the most rationalistic views, his disciples none the less accepted the doctrine of immortality, and even came to believe in rewards and punishments after death.

The followers of Lao-tseu, the Taoists, devoted themselves specially to the problem of immortality. They made efforts to discover an elixir that would be capable of prolonging earthly life to eternity. "One of the chief claims of Taoism," wrote Réville, "was the possession of a specific against death. It was true that they admitted this to be not only very difficult to obtain, but still more difficult to employ. However, if certain rules were observed strictly they were at least confident of great prolongation of life. It was only the very few Taoists who had reached perfection who could hope to pass into the better world without being subjected to the pains of death." † And so some of the masters of Taoism, such, for instance, as Chang-Tao-Ling, ascended to heaven without dying, by climbing a lofty peak and vanishing into the skies." ‡

The ordinary Taoists accepted fully the idea of immortality. They "taught the doctrine of purgatory for those who were not evil. To arrive at this, Lao-tseu simply expanded and applied to mankind generally an idea that was already familiar to him, the conception of the transmigration of one soul through several successive bodies. By means of

---

* "Histoire des Religions," vol. III., "La religion chinoise," Paris 1889, p. 187.

† *Loc. cit.* p. 450. ‡ *Ibid.* p. 444.

such expiatory transformations, a man who had not reached it directly through the holiness of his life, could attain the immortality of genii and the blessed." *

It was believed for long that the Taoists, following the teaching of their master, did not recognise a hell. But this opinion has had to be abandoned, because the "Taoist clergy have provided, in the temples dedicated to the tutelary deities of their cities, paintings illustrating the torments prepared for the guilty by the ten courts of justice that sit in the depths of an ocean hidden in the interior of the earth." †

Clearly then, many Chinese, both Taoists and followers of Confucius, believe in the existence of a world beyond the grave. However, the denial of immortality has been ascribed to Buddhists in particular.

Buddha accepted the Brahmanist doctrine of transmigration of the soul. This has been established clearly on the evidence of several documents of admitted authenticity. Orthodox Buddhism is somewhat vague on the immortality of the soul. Buddha himself avoided making a decisive statement on this matter. In such circumstances "those who were terrified at annihilation, and who could not give up the hope of eternal happiness, interpreted the silence of Buddha according to their own desire, and inferred that he did not forbid them to hope." ‡

There are many instances of the evasions of Buddhist teachers when they were pressed with this disturbing question. Pasénadi, the king, once met Khémâ, the nun, a disciple of Buddha, renowned for her wisdom. The king put to her the following question: "Does the Perfect One (Buddha) exist after death?" "The Sublime One, O

---

* "Histoire des Religions," vol. III., "La religion chinoise," Paris, 1889, p. 469.

† *Ibid.* p. 470.

‡ Oldenburg, "Le Bouddha," French translation, p. 281, Paris, 1894.

great king, has not revealed to us the existence of paradise beyond the grave." "Then the Perfect One exists no longer now that he is dead, O reverend lady?" "Neither, O king, has the Sublime One revealed that He who is perfect does not exist now that He is dead." "Am I to believe, then, O reverend lady, that the Perfect One still lives, although He is dead, and at the same time does not live? Am I to believe, O wise lady, that the Perfect One being dead, neither exists nor does not exist?" *

Take again the mode in which Soumirmitá,† "the son of a god, and surrounded and preceded by a crowd of gods," worshipped Bouddha (Tathâgata): "Thou art the physician, skilful to save, and who givest the gift of life everlasting."

The Buddhists, as they were not given clear doctrines on this subject, very naturally followed their inclinations by accepting the idea of life beyond the grave. And certainly Buddhism does not teach annihilation of the body after death, although this has been lightly taken for granted. On the contrary, it is so persuaded of survival after death as being the rule, that it grants only to rare and elect souls the privilege of at length laying down the burden of continuous life.‡

The Chinese Buddhists retained the fundamental conceptions of the ancient religion of their land and continued to worship their ancestors and to seek the readiest path to immortality. They soon came to transform Nirvâna into paradise, and to inculcate in the Chinese race the doctrine of future rewards and punishments. "The Buddhist monasteries in China for the most part possessed a set of little

---

* Oldenburg, *loc. cit.* p. 282.

† "Lalita Vistara," *loc. cit.* p. 303.

‡ Réville, *loc. cit.* p. 475.

rooms, in which there were depicted, in vivid colours, crowded scenes from the eighteen hells of tribulation and lamentation. For there exist under the earth eight hells filled with the torments of fire, and ten with the equally terrible horrors of ice." *

The paradise of the Chinese Buddhists, or Ni-pan (Land of the Pure), is a region abounding in "gold and silver, and precious stones. Rivers of crystal run on golden sands covered with splendid lotus-flowers and traversed by delightful paths. Lovely music is always to be heard. Three times a day a shower of blossoms falls. There are to be seen there gorgeous birds, pheasants, and parrots, and many others; and these, every quarter of an hour, in a choir of melodious voices, trill out the beauties of religion and recall to their hearers the Buddha, Dharma, and Sungha. These are some of the wonders prepared for those who are born again after death. Into that land neither sin nor any evil enters.".†

I need no longer accumulate details to show the falseness of the view that a third of humanity profess materialism to the exclusion of any belief in survival after death. On the other hand, it is quite certain that the vast majority of mankind is convinced that death puts no definite term to existence, and that this life is no more than a passing stage leading to a life to come. However, although many simple races believe that the future life is merely a continuation of this life, the more subtle-minded races present the future life as filled with delights for the good and with torments for the wicked.

Such an idea of the next world, which is very generally accepted, is probably the basis of religions. From it have come the conceptions of supreme beings and divinities

---

* Réville, *loc. cit.* p. 556.

† *Ibid.* p. 525.

✓ Many facts go to show that the primitive gods were no other than the relatives and ancestors of the living, now dead, yet living in another world and ruling the affairs of this world. Wicked ancestors became transformed into evil spirits, while good ancestors became mild and benevolent deities.

✓ Very many peoples offer prayers to their ancestors and treat them as gods. The Kaffirs pray and sacrifice to their dead relatives, believing that the spirits of the dead haunt their late dwelling-places, and, according to their characters, help or torment their descendants. As they are able to cause good or evil after death, these play the part of gods. But, as Lubbock points out ("Origin of Civilisation"), it must be remembered that the god of a savage is only a being like unto himself, although probably rather more powerful, and I shall show that there are many intermediate stages between true gods and mere dead parents whose malice is to be feared, or whose kindness is to be supplicated.

The North American Indians[*] pray to the spirits of their forefathers for good weather or luck in hunting, and fancy when an Indian falls into the fire that the ancestral spirits pushed him in to punish neglect of the customary gifts, while the natives of Louisiana are said to have even gone so far as to build temples for dead men. In Polynesia "at Tanna, the gods are spirits of departed ancestors, aged chiefs becoming deities after death, presiding over the growth of yams and fruit-trees, and receiving from the islanders prayer and offerings of first fruits."[†] In the Malay Islands "the souls of deceased ancestors are looked to for prosperity in life and help in distress." In Africa ancestor-worship is well developed. The Zulu warriors, "aided by the amatongo,' the spirits of their ancestors, conquer in the battle. Even the little children and old women, of small account in life, become at death spirits having much power, the infants for kindness, the crones for malice. But it is especially the head of each family who receives the worship of his kin." * The Zulu adores his father, when he is a chief, above all others, and is convinced that a father remembering his love for his children, will not forget them when he is dead. "The Zulu follows up the doctrine of divine ancestors till he reaches a first ancestor of man and creator of the world, the primeval Unkulunkulu." †

---

[*] Tylor, "Primitive Culture," vol. II., pp. 113–114, Third Edition, 1891.

[†] *Ibid.* vol. II., p. 114.

So great is the number of instances that it is too difficult to choose from them. The fundamental idea is always identical, although details and accessories vary, as one passes from the hardly idealised relatives of negro tribes and goes progressively to the "Father Almighty, Maker of heaven and earth" of the Nicene Creed.

The conception of a future life in the form of immortality or some kindred state, associated with the conception of many gods or of one God, has been developed to satisfy the craving for life and to combat the fear of death, that is to say, to defeat the greatest contradiction in the constitution of man. I must now inquire how far the different religions have been successful in this object.

Many primitive races have absolute faith in the tenets of their religion, and believe in the promise of life beyond the grave as in a certain fact. Thus the aborigines of the Fiji islands are convinced that they will be born again, in another world, in the exact condition in which they leave this life; and so they wish to die before being afflicted with any infirmity. As it is very difficult to reach old age without being the victim of some illness or infirmity, when

---

* *Ibid.* p. 115.

† *Ibid.* p. 116.

a man feels the approach of age, he tells his children that the time has come for him to die. If he himself fails to give this notice, the children undertake the duty. A family council is called, the day is appointed, and the grave made ready. The old man is allowed to choose between being strangled and being buried alive. The following instance will show the strength of a belief in life to come. Hunt, an English traveller, quoted by Lubbock, received a visit from a young native of Fiji, whose purpose was to give an invitation to the funeral of his mother which was to take place next day. Mr. Hunt accepted the invitation and joined the procession, but as he was surprised to see no dead body, inquired about it from the son. The son pointed out his mother, walking in the procession and as gay and animated as any of the others. Mr. Hunt stated his surprise, and asked why he had been deceived by being told that the mother was dead, when she was plainly as much alive and as well as any one else. He received the reply that the death festival was about to be celebrated ; that presently they would bury her ; that she was old, and that his brother and he, thinking that she had lived long enough, and should be put to death, had obtained her cheerful consent.

This case is far from being solitary, because many villages have been described as containing no inhabitants of a greater age than forty years, all those older having been buried. It is not difficult to understand that death should have no terrors for persons possessed of a faith as strong as this. The American Indian, according to Lubbock, has very little fear of death. He does not fear transference to a realm in which, as he has been told all his life, there is no sorrow and abundance of joy.

I know a case of a young girl of the Catholic faith who believed so firmly in the joys of Paradise that, when stricken with a mortal illness, she awaited death with a great impatience. Before she died, she cried out that "already she could see the beautiful flowers and hear the sweet music of the birds that fill heaven."

But it is rare to find faith so strong in such a case. More often faith is not strong enough to subdue the fear of death, and in proof of this I may recall the instance of the clergyman already given.* Stricken with an incurable disease, he, in spite of his religion, underwent extreme agony, and could not reconcile himself to the idea of death. The fear of death showed itself so strongly in this case that I have chosen it as a characteristic instance of the feeling.

It is only with fanatics and simple or primitive persons that blind faith can subdue this instinctive fear. For this reason, since the most ancient times, religions have sought out something more than the promise of paradise to mitigate this chief disharmony of our nature. In this connection the doctrines of Buddha are those most interesting. Here I shall not deal with that modified and transformed Buddhism, in which, as I have already shown, there was a return to the doctrine of future life, with its hell of torments and heaven filled with delights.

Buddha made no reference to the great blot on human life. His doctrine, in its original form, was extremely pessimistic. Take, for instance, some of his sayings on this subject: "Miserable in truth is this world, in which there is beginning, birth, growing old, death, disappearance and renewal. But we know not how to escape from this world, full of horror though it be. Alas, because of old age, illness, death, and their like, we know not who shall put an end to this world, which is so full of horror. To all who are, there comes old age, and illness. and death. and their like." †

---

* See p. 124.

† The "Lalita Vistara," p. 289.

When the Buddha came upon the sorrows of the world, as I have already described (p. 119), he reflected as follows: "Woe upon youth, threatened by old age! Woe upon health, which so many maladies destroy! Woe upon the life of man, which lasts but a little space! Woe on the temptations of the flesh, which lure the heart of the wise! Would that there were neither old age nor illness, nor death and the pains of death, which come from the five elements of life (Skandhas)! Would that there were neither old age nor illness nor death, which are for ever bound up together! Nevertheless, when I return again I shall consider deliverance." *

Having pondered for many days on these problems, Buddha thought that he had discovered the only solution, and taught men resignation. When a man was young he would ask of his father: "Lord, would that old age would never come upon me, and that I should keep for ever the warm colour of my youth; that I should be always filled with health, and that no disease should come near me; that my life should be prolonged for ever, and that death should pass me by! Such an one later on must learn to give up these longings." †

In his famous "Sermon at Benares," Buddha gave in brief the outlines of his doctrines in the following words: "Hear, oh monks! the holy truth of the springs of sorrow! Sorrow is born of lust of life, that drags us from incarnation to incarnation, and of pleasure and desire, which seek their fulfilment hither and thither; the lust of pleasure, the lust of life, the lust of power. Hear, oh monks! the holy truth of the conquest of sorrow; it is the killing of this lust by the utter abandonment of desire, the giving up of all desire,

---

* The "Lalita Vistara," p. 176.

† *Ibid.* p. 170.

the forgetting of all desire, the freeing of the body of all desire, until there is no place left for desire." *

In such a spirit of resignation, Buddha became himself a monk, and lived according to the strict rules of the pure life that he himself had laid down (" the belief pure, the will pure, the language pure, the deeds pure, the means of livelihood pure, the study pure, the attention pure, the meditation pure"). However, he did not find many kindred souls to follow the same precepts. Buddhism soon moved away from these original tenets, and became a religious doctrine of the ordinary kind.

We are inclined to associate with Buddhism the doctrine of Nirvâna, as if the latter were the goal to which human life should be directed. Many philosophers, and the pessimists chief among them, naturally with Schopenhauer at their head, have adopted Nirvâna as the goal of mankind, as they see the world. However, the word Nirvâna has had many interpretations put upon it, the which is less surprising as Sanscrit scholars differ. I do not intend to join in the discussion, as I myself am not acquainted with Sanscrit, upon which the argument must be founded. However, I cannot pass it by without comment on the pretext that it has not yet been settled definitely by specialists, as it is the case that many thinkers regard Nirvâna as the goal of human existence.

For long Nirvâna was represented as a sort of blank, in which there was no display of any mental operations. Max Müller,† the celebrated Oxford professor, opposed this interpretation on the ground that, according to him, in " all passages of Buddhistic origin in which Nirvâna occurs there is nothing to betoken annihilation. Most of these passages, if not all of them, would be quite unintelligible

---

* Oldenburg, p. 214.

† " Buddhagosas Parables."

if we were to replace in them the word Nirvâna by the word annihilation."

Many other specialists share this view, and cannot agree that the goal of human life was to be annihilation,. Rhys Davids, for instance, thinks that Nirvâna is to be interpreted as a tranquillity of the soul, possible of achievement in this life, and that the word is best translated by the term "sanctity." According to him, Nirvâna does not mean extinction or annihilation, but rather freedom from the great passions, such as envy and hate. Pfungst * agrees with Max Müller ; he is convinced that the first adepts of Buddha could not have conceived of Nirvâna as extinction. Dahlmann † on the other hand, tries to prove that Nirvâna in its primitive signification implied the abolition of the will to live, and really corresponded to annihilation.

I must add, however, that Nirvâna did not occupy a place in Buddhism so important as has been ascribed to it by several commentators. In many of the Buddhist authorities mention of Nirvâna is only accidental. In the "Lalita Vistara," for instance, the word occurs very seldom, and then only in unimportant connections. However, the latter document contains a good deal that serves to explain the conception of Nirvâna.

When the young Buddha, still very exacting, asked his father to obtain for him perpetual youth, health, life everlasting, and freedom from death, he added the following words : "Lord, if you cannot give me these four gifts, at least bring it about that after this life I shall have no more metempsychoses." ‡

As I have already stated, Buddhism had embraced the

---

* "Das Freie Wort," pp. 603–607, Jan. 5, 1902.

† "Nirvâna," Berlin, 1896.

‡ "Lalita Vistara," p. 176.

Brahmanistic doctrine of transmigration of souls. According to the legend, before his birth as a prince, the Buddha had passed hundreds of earlier existences. His soul had been the soul not only of fifty-eight kings, but of eighteen monkeys, four horses, four snakes, three lizards, two fish, and of other creatures.* Such continual transferences of the soul to so many different animals was a source of perplexity and sorrow to believers. It was natural that a great thinker like Buddha should have conceived the desire of sparing himself and his faithful followers so many transmigrations. He thought of these rebirths as a great evil, from which a pure life might set one free.

In the poetical language of the Hindoo Buddhists, metempsychosis was compared to the ocean ; the waves that change from moment to moment were the continual rebirths ; our temporary body was the foam of the crests of the waves, while Nirvâna was the opposite shore. He who reaches Nirvâna would never again plunge into the great sea of Sangsâra. In a passage quoted by Rhys Davids, and ascribed to Kâma Sutta, it is stated expressly that "the sea is an image of the Sangsâra or transmigrations, while Nirvâna is an island upon it. Once the shores have been reached, a soul will no longer be plunged in the waves of the ocean, and will be freed from the successive births of metempsychosis."

In other words, to avoid being tormented after death by perpetual rebirths, some of which may be humiliating, it is necessary to live a pure life and so to secure repose or Nirvâna. Nirvâna is by no means the cessation of all consciousness, but merely the end of transmigrations. From such a point of view, it is possible to interpret all, or at least nearly all, the passages in which Nirvâna is spoken of.

---

* Spence Hardy, "A Manual of Buddhism," p. 100, London, 1853.

When he was old and full of disease and afflicted with grievous pain, Buddha, being at the point of death, thought of his disciples and called them to him and said: "It is not meet that I should enter Nirvâna without having spoken with those who have cared for me, without speaking to the community of disciples. By the force of my will I shal subdue this disease and hold the life within me." Some time afterwards, the reverend Ananda went to Buddha and spoke to him, saying amongst other words as follows: "The Sublime One will surely not enter into Nirvâna ere he has made known unto the community of disciples his wishes regarding them." "Growing more and more feeble, the spirit of Buddha passed from ecstacy to ecstacy without ceasing, and knew every delight; then he entered into Nirvâna. And the earth trembled, and thunder rolled across the skies." *

It is clear that in this passage Nirvâna was associated with death. But it was with the death of a saint who had lived a pure life. Metempsychosis would not be inflicted on him, and he would enjoy repose. It is probable that the term Nirvâna later on came to be applied to the state of mind of a saint who, by living the pure life, would avoid transmigration after death.

As the importance of Nirvâna lies in its contrast with metempsychosis, it is easy to see why the precise state of mind involved in it has not been described exactly. However, a survey of the Buddhistic writings makes it plain that at least Nirvâna was not associated with annihilation. In this respect Max Müller's verdict must be taken as correct.

Buddha's attempt to remedy the ills of human life, then, lay in a complete renunciation of all the joys and pleasures of life, and in perfect resignation. The mere fact that

---

* Oldenburg, *loc. cit.* pp. 200–206.

primitive Buddhism did not persist, but rapidly passed into an ordinary religion, is sufficient proof that Buddha did not achieve his purpose. It was the promise of a life to come that attracted so many men and spread Buddhism over so large a part of the earth. However, this faith has been able to maintain itself only in certain strata of society to which the rationalistic conception of the mental processes has not penetrated. Since the awakening of the scientific spirit in Europe, it has been recognised that the promise of a future life has no basis of fact to support it. The modern study of the functions of the mind has shown beyond all question that these are dependent on the functions of the body, in particular of those of the central nervous system. A slight lowering of the rate of the circulation of the blood, a fleeting anæmia of the brain, at once arrests consciousness, that is to say, the fundamental sensation of the individual mental life. Anæsthetics, used in doses so small that they do not influence certain parts of the nervous system, as, for instance, those that control the heart and lungs, completely abolish consciousness. Persons who are put under chloroform for surgical purposes fall into a state of absolute unconsciousness. Sometimes. after undergoing painful sensations, especially sensations of oppression, the patients imagine themselves to be in rapid motion, and in a few moments have the sensation of falling into an immense gulf, after which comes nothingness, the annihilation of sensations and of consciousness. In other cases, patients, without any sensation of catastrophe, lose all idea of reality, and every psychic and sensorial function is abolished. Such states are very closely similar to death, which indeed is the result, in certain rare instances, of the ordinary process of being chloroformed.

Neither the narcosis produced by chloroform nor that produced by any other form of anæsthetic, affords any particle of ground for the view that there is consciousness in any form apart from the body. The action of morphine sometimes brings about a strange current of happiness and an apparent weightlessness of the body; but here again there is no suspicion given as to the existence of any mental phenomena apart from the body.

Consciousness of personality is of supreme interest from the point of view of personal immortality, and this mental phenomenon develops only slowly and progressively in an infant. This fact, again, like the facts of narcosis, shows the dependence of consciousness on the action of the bodily organs. Just as our consciousness comes out of nothing in the first months, or years, of our life, so it will pass into nothing at the end of our life.

Mental disease confirms this conclusion, and it, too, gives no ground for the belief in a survival of the mind after death.

Certain internal sensibilities in the depths of our organism survive our personal consciousness. When the heart has ceased to beat, and when the anæmic brain is certainly incapable of personal consciousness, some portions of the body may still retain vitality. The muscular fibres are still able to contract when they are stimulated, and the white corpuscles of the blood can still exhibit their specific movements. It is certain, moreover, that these white corpuscles possess a specific sensibility, and, by a sort of sense of taste, respond to the kind of environment that surrounds them. Our consciousness, however, is absolutely out of touch with the sensations of these globules, which, however, none the less are part of our organism. It happens, therefore, that in certain diseases, the white corpuscles, stimulated by the presence of particular substances, perform extensive movements of migration within our bodies. Such migration is quite outside the sphere of consciousness. The corpuscles, directed by their sensibility, are in constant pursuit of microbes that have entered the body, and yet these actions, too, are not made known to our consciousness. In the same fashion, the thousands of active spermatozoa in the male organs and the ova in the female possess specific sensibility. These reproductive elements contain the germ of individual consciousness, but it is not until they have developed into the new generation that it is possible to impute to them individual consciousness, and the organism that shelters them has no idea of what it harbours. The sensibility of the white corpuscles and of the many other cells composing our body, although certainly a reality, has no part in the absolutely special sensation that we call individual consciousness, and which is all we think of in wishing to escape death.

The idea of a future life is supported by not a single fact, while there is much evidence against it. The phenomenon of intercommunication across a distance, sometimes called telepathy, may be actual, but affords no support to the conception of the existence of souls apart from bodies. It may be that emanations are given off by certain organs, and that these are capable of being appreciated by the organs of another body at a distance; but, even if such were the case, we should have to deal simply with other bodily functions. Moreover, the supposed phenomena that fall within this category are so rare, so difficult to observe, and so obscure, that no certain argument for the continuance of existence after death can be deduced from them.

It is easy to see why the advance of knowledge has diminished the number of believers in the persistence of consciousness after death, and that complete annihilation at death is the conception accepted by the vast majority of enlightened persons.

Apart from their chief function of consoling men for the inevitability of death, religions have concerned themselves with some of the results of other disharmonies of the human constitution. From time immemorial they have claimed the direction of diet, the control of the reproductive functions, and the prevention or cure of all kinds of disease.

The dietary regulations given by the religions are familiar. Even at the present day, the cookery of many races is regulated by their religion. The Jewish diet, notably, is regulated by the Mosaic law, down to the most minute detail. For instance, it was forbidden to eat the blood of animals. Moses commanded: "Notwithstanding, thou mayest kill and eat flesh in all thy gates, whatsoever thy soul lusteth after, according to the blessing of the Lord thy God, which he hath given thee; the unclean and the clean may eat thereof, as of the roebuck, and as of the hart. Only ye shall not eat the blood; ye shall pour it on the earth as water." * Later on: "Only be sure that thou eat not the blood; for the blood is the life; and thou mayest not eat the life with the flesh." † "Thou shalt not eat it, that it may go well with thee, and with thy children after thee, when thou shalt do that which is right in the sight of the Lord." ‡ The Books of Moses also contain receipts for the cooking of certain meats. "Eat not of it raw, nor sodden at all with water, but roast with fire, his head with his legs, and with the purtenance thereof." §

It has been suggested that these rules were founded on ideas of hygiene in consonance with the results of modern

---

* Deuteronomy xii. 15, 16.

† *Ibid.* 23.

‡ *Ibid.* 25.

§ Exodus xii. 9.

science. Some of them, it is true, such as the prohibition of uncooked or partially cooked meat, are confirmed by our modern knowledge. But the greater number of the Mosaic rules, as, for instance, the prohibition of the consumption as food of blood or the flesh of pigs or hares and so forth, are in direct opposition to a modern knowledge of hygienic diet. Religious cookery has no more than a historical interest.

The religions have been greatly occupied with the functions of the reproductive organs. Most of the founders of the great faiths have paid a keen attention to the disharmonies of this side of our constitution. They became persuaded of the merit of abstention, which they practised themselves and preached to others. Buddha, after devoting his youth to all the pleasures and not being satisfied, passed to absolute asceticism. He and his adepts formed an order of monkhood, on which an absolute celibacy was imposed. If a member of the order had intercourse with a woman, he was considered to be as guilty as a murderer or a thief. In the Buddhist rules framed even for laymen, "sexual intercourse outside marriage was forbidden, on the ground that it was degrading." *

The views of the Christian religion on sexual matters are well known. The leaders of Christianity abstained from sexual intercourse and recommended their conduct to others. St. Paul more than once affirmed his own continence. "For I would that all men were even as I myself; but every man hath his proper gift of God, one after this manner, and another after that. I say therefore, to the unmarried and widows, It is good for them if they abide even as I; but if they cannot contain, let them marry, for it is better to marry than to burn." †

---

* Rhys Davids.

† Corinthians vii. 7–9.

The religions of savage races are equally concerned with the reproductive functions. There are many extremely strange facts known concerning this matter, and among such I may mention that the Sandwich Islanders have a deity who presides at abortions. This god is made in the form of an elongated wooden instrument, and is known as "Kapo." The upper part of the deity is shaped into a grotesque head, while the lower portion terminates in a point and serves to induce abortion by entering the uterus and rupturing the fœtal membranes.*

Many other idols are used by savages as protections against disease. Ploss-Bartels,† in his treatise on "Medicine among Primitive Races," has described a large collection of talismans of this kind. The ruling idea in the manufacture of these is that diseases are due to the presence of evil spirits, who are to be scared away as soon as possible. The Goldi of Siberia construct straw or wooden figures of men and animals to absorb the spirits of diseases. The Guilaks make wooden human figures, on the breasts of which are fashioned images of toads. These talismans are used as remedies for diseases of the chest and stomach.

In higher forms of religion there remain abundant traces of such notions. Even Martin Luther declared that disease was supernatural in origin. "Behold a matter on which there is no room for doubt," he stated, "and that is that the plague, fevers, and other diseases are the work of the devil." A number of religious ceremonies were specified as the best remedies for diseases.

The plague has left many deep marks on human history, and it is natural that a malady so terrible should have attracted serious attention. It was usually attributed to divine wrath, which was to be appeased by purification and sacrifice. Human beings were slain on altars to appease the wrath of God and to lessen the mortality from plague.

---

* Ploss-Bartels, "Das Weib," vol. I., p. 859.

† "Die Medecin der Naturvölker," p. 225, Leipzig, 1893.

Such religious customs have disappeared almost completely with the advancing culture of man, but traces of them survive and become apparent on occasions. Quite recently, when the King of England, Edward VII., was afflicted with an abdominal suppuration, he was given the assistance of the most highly skilled modern surgery, but at the same time special services were held in the churches to aid the cure of the royal invalid.

Every one has now come to regard such events as mere relics of old customs without intrinsic importance. Hygiene in the kitchen and the prevention of disease are no longer under the control of religion, but are regulated on scientific knowledge obtained by the experimental method. I need pay no further attention to these matters. However, religion is still occupied with the problem of death. The solutions which as yet it has offered cannot be regarded as satisfactory. A future life has no single argument to support it, and the non-existence of life after death is in consonance with the whole range of human knowledge. On the other hand, resignation as preached by Buddha will fail to satisfy humanity, which has a longing for life, and is overcome by the thought of the inevitability of death.

It was to be expected that in such a state of affairs philosophers would have sought an issue from the dilemma. Certainly many philosophical theories have been propounded to explain life and death. As the subject is of extreme importance I shall reserve a chapter for it.

CHAPTER VIII

ATTEMPTS IN SYSTEMS OF PHILOSOPHY TO REMEDY THE ILLS ARISING FROM THE DISHARMONIES OF THE HUMAN CONSTITUTION

Some philosophical systems are in intimate union with religions—Ideas of ancient philosophers on the immortality of the soul—The teaching of Plato—The scepticism of Aristotle—The Stoics—Cicero, Seneca, Marcus Aurelius—Modern philosophical systems—Pessimism and its origin—Lord Byron—Theories of Schopenhauer and Hartmann—Mailaender's philosophy of deliverance—Criticisms of pessimism—Max Nordau—Ideas of modern thinkers on death

SYSTEMS of philosophy are closely attached to religious doctrine. Buddhism, for instance, originated in a philosophic theory which acquired a religious character in the hands of the followers of Buddha. Similarly, many systems of philosophy are merely religious dogmas which it has been attempted to support by rational argument apart from supernatural revelation.

The idea of life beyond the grave has long since furnished one of the principal bases of various philosophic doctrines, the ultimate object of which was to solve the problem of death. Ancient philosophy is full of such. Plato describes the tragic death of his master Socrates, and in connection with it expresses very clearly his ideas upon death. He puts these words in the mouth of Socrates in the " Phaedo": " Fa from being depressed by the death of a friend, I felt, on the contrary, that he was to be envied; as I witnessed his attitude, and listened to his words, and noticed the courage with which he faced death, I became convinced that he did not quit this life without some divine support that drew him towards another world in which he would find the most perfect happiness man could wish."

Plato attributes to Socrates a very definite view as to future retribution: "In truth," said Socrates, "if I did not expect to find in another life gods at once good and wise, and men better than those of this life, it would be foolish of me not to be disturbed by the approach of death. But I know that I look to finding myself among just men. I do not fear to die, because I am confident that something still remains after this life, and that, according to the old belief, the good will be treated better than the bad."

As such views were not derived from a body of revealed truth, it was necessary to support them by reasoning. Plato therefore went on to try to convince us of the immortality of the soul by speculative hypotheses. He recalled the Pythagorean doctrine of metempsychosis, and suggested that the souls who had abandoned themselves to injustice, tyranny, and plunder would pass into the bodies of wolves and hawks and falcons, for souls of that nature could not go elsewhere; while the souls of those who had practised the social and civic virtues known as temperance or justice, would inhabit the bodies of peaceful and gentle creatures such as bees and ants, or would even enter other human bodies and again become good men.

Plato referred also to the law of contrasts in support of his theory. "As the most strong often springs from the feeblest, or the most swift from the slow, so life gives rise to death, and from death life springs." "From that which is dead," said Socrates, "is born all that lives and has life. And so our souls after death pass to the infernal regions." "As we must grant that the dead are born from the living as much as the living from the dead, it is plain that the souls of dead men exist somewhere, whence they may return to life."

By such arguments Plato tried to prove the immortality of the soul, the fundamental basis of his philosophy, and put them in the mouth of his master Socrates on his deathbed. In the dialogue he tried to refute all kinds of objections. But, in spite of the assurance with which he formulated his doctrine, there may be seen underlying the argument a note of doubt, and it is just this that distinguishes philosophy from religion.

It is evident that the whole of Plato's system was the result of an effort to solve the problem of death. Again and again he said that the true philosopher lived only to be ready to die; that being so, he declared it to be childish for men at the last to shrink from what they had so long been making ready for. It was himself that Plato wished to convince of a future life. "I do not seek," he said, "to persuade all those who are here of the truth of what I say, although to do so would greatly please me; what I aim at is to convince myself. Behold me, dear friend, in pursuit of an argument that, as you see, interests me deeply; if what I say turns out to be true, it is good to have believed it, and if there be nothing after death, at least I have gained this, that while I am still with you, I am not borne down with grief."

The doubt which was only latent in Plato was much more active in some other ancient philosophers. Aristotle * at one time admitted that part of the soul was immortal,

---

* Zeller, "Die Philosophie der Griechen," vol. II., Part 2, pp. 462, 465. Tübingen, 1862.

but that the other part was mortal. The two parts came together at the beginning of a life and separated at its end. Later on, however, Aristotle abandoned this theory of the immortality of the personal consciousness, and argued strongly against the Platonic theory of the immortality of the soul, although, however, he still believed in the indestructibility of the "rational spirit," an immortal principle.

The Stoics still further developed such a conception. They held that besides the individual soul there was a universal soul, a presiding influence in which all others had their being.

Cicero, again, discussing old age and death, tried to establish belief in a future life. "I am convinced," said Cicero to Scipio and Laelius, "that your illustrious fathers, who were so dear to me, are still full of life, and of the only life worthy of the name; for the body is, as it were, our prison-house, within which we must accomplish the tasks laid on us by necessity. When I think of the activity of the human spirit, its vast memory, its prevision, its store of art and knowledge, and experience, I am convinced in the depths of my being that an existence with such qualities cannot be mortal. The soul is continually active, and its activity comes not to it from without; the soul is a self-supporting activity, and cannot come to an end. Moreover, as the soul is a simple substance, unalloyed by any mixture of materials, it can neither be divided nor made to perish." By such arguments Cicero sought to prove the immortality of the soul. "I will tell you," he said, "why old age, so far from being grievous to me, is full of delight." But in the end, he himself saw the weakness of his proof, and the note of scepticism appeared in him more strongly than in his predecessors, so that he came to say as follows: "If I am deceived as to the immortality of the soul, I am deceived gladly, and I would not have the belief torn from me while I live. If, when I am dead, all feeling is arrested within me, as some pretended philosophers hold, at least I have not to fear that after my death they will come and mock me for my error."

Scepticism becoming more and more definite, belief in the immortality of the soul persisted only in the purely religious form. Philosophical systems freed themselves of it, and replaced it by a vague form of pantheism.

Seneca tried to support the thesis of immortality, but one gets the impression strongly that there was no vigour in his belief. He is content with poetry rather than with reason. "The events of this mortal life," he wrote in one of his celebrated "Letters," "are the mere prelude of a better and more lasting existence. As our mother's womb, bearing us for nine months, shapes us not to live there for ever, but for our place in this world in which it places us, with the strength to breathe this air and to withstand surrounding things: so, also, the time that passes from our infancy to our old age is a preparation for a second birth. Another beginning and another world await us. Until then, we could not endure, save from afar, the splendour of the heavens. Learn then, O man, to face without a shudder the decisive hour, the last hour of the body, but not of the soul. What you see around you consider but as the furniture of an inn; soon you are going further on. The day that you dread as your last day is your birthday into immortality."

In the midst of these glowing visions, however, Seneca is assailed by dark and gloomy thoughts. "Yes," he cried, "all that is must perish; death comes to every living thing. Every day, every hour, reveals to man the coming of death; there is always some new lesson to remind him of the fragility he had forgotten, and from a dream of eternity to turn his thoughts to the grave."

These heights and depths of spirit led Seneca towards a new theory in which he gave a final expression of his views on the great problem of human existence. "All beings pass through definite stages; they must be born, grow and die. The stars that we see revolving above us, the earth on which we are carelessly scattered and which seems to us so solid; all is threatened and all will come to an end. Old age comes on everything; although the period is very different, the same end comes to everything. Everything that now is will cease to be; but for all that the world will not perish; it will dissolve. Dissolution is destruction for us. As a matter of fact we think of things only as they concern ourselves; our degenerate soul, incapable of detaching itself from the body, sees nothing beyond that; none the less we should endure the idea of the death of ourselves and of those near to us with a greater fortitude were we to realise that nature is a constant routine of birth and death, that all composite bodies must dissolve, that the dissolved substances re-form, and that the creative power of God displays itself in this cycle of change throughout the universe." From such a final conception of the universe he draws the consolation: "A great soul should know how to obey God and submit willingly to the order of the universe. If it be not for a better life that we are to quit this life, if not to find a home in the skies more tranquil and more brilliant, our souls, free from suffering, will return to the spirit that gave them birth and will mingle in the great all."

In other words, abandoning the image of life after death that played so consoling a part in primitive beliefs, philosophy became content to advocate resignation to the inevitable laws of nature, and to console itself with the promise of a vague return to some universal, eternal principle.

The conceptions of the Stoics, especially in the form presented by Seneca, found an ardent and brilliant exponent in Marcus Aurelius, whose "Thoughts" are known to all the world. He had much to say of the problem of death and of the attitude of the philosopher towards it. "Death," said Marcus Aurelius, "like birth, is one of nature's mysteries. In the two are present the same elements: in the one case in the phase of combination, in the other in that of dissolution." In death "there is nothing repugnant to the essence of an intelligent being, nor to the general plan of our nature." But his ideas on death were vague. "Death may perhaps be a dispersal or resolution into atoms, or an annihilation in the sense of extinction or deplacement." "Alexander of Macedon and his mule-driver were reduced at death to the same condition, that is to say they returned alike to the originating principle of the universe, or one and and the other were scattered as atoms."

Although he was definitely a deist, Marcus Aurelius was undecided as to the immortality of the soul. "If souls have not disappeared," he said, "how can the air contain the eternal generations of them?" "Remember well," he said in another place, "that that feeble and composite creature, your soul, will one day resolve into its atoms; the faint spark of life will be extinguished, or be assigned to some other dwelling-place." Clearly enough, there was no consoling hope of a future life to be derived from these halting dubieties. It was needful to replace by some other anodyne the belief that for so long had brought comfort to poor humanity.

Marcus Aurelius tried to counteract the fear of death by the following reflection: "To fear death is to fear either being deprived of all feeling or being subjected to some other kind of feeling. But, if we are deprived of all feeling, we shall have no evil to fear · if we are to find new kinds of sensations, our existence will be different, but still existence." However, he probably realised the weakness of such a consolation, for he tried to link the problem of death with the general principles of human conduct.

As I mentioned in the first chapter of this volume, Marcus Aurelius, like many of the philosophers of antiquity, held the view that man ought to live according to the dictates of human nature. The theory recurs again and again in his "Thoughts." "The fig tree lives according to its kind, the dog like the dog, bees like bees, and man like man." He expresses this view still more emphatically in the following words: "Man must live in conformity with the laws of his nature." "No one will prevent you from living according to the laws of nature, and nothing can happen to you that is not in accordance with nature's universal law." "Neither hand nor foot can do that which is contrary to the laws of nature, because the foot can only fulfil the functions of the foot, and the hand those of the hand. Similarly with man, to behave as a man is not to defy nature's laws, because it is only fulfilling the functions of man. And that which is not against nature cannot be evil."

Being full of this theory, Marcus Aurelius applied it to death, which, being a natural phenomenon, was to be accepted without protest. "For, after all, nature forges the links and nature breaks them. Is she about to sever them? Very well, let us then say farewell as if we were taking leave of our friends, but let there be no tearing of the heart strings, and let us go willingly, and so avoid being dragged away. This, too, is in accordance with the laws of nature."

"Philosophy," according to Marcus Aurelius, "is to await death peacefully, and to regard it as merely the dissolution of the elements which compose the human frame. Such is the law of nature, and whatever is in conformity with nature is not evil."

Death, being a phenomenon in conformity with nature, must be submitted to. "Do not abuse death," advises Marcus Aurelius, "but accept it with resignation, as being in accordance with the will of nature. Do we not pass on from infancy to youth, grow up, and become tall and attain manhood? Do not our teeth come, our beards grow, and our hair turn white? If we marry, do we not beget children? Are not all such events in their due season, and the work of nature? Death comes through the same agency. It therefore behoves a wise man to approach death with neither anger, repugnance, nor contempt, but to await it like any other operation of nature." *Resignation*, then, is what this form of philosophy amounts to. Not only must death be accepted as inevitable when it comes after a long life, but even if it surprise us at an unexpected time. "He who dies after reaching the uttermost limits of human life," says Marcus Aurelius, "has reached no further than he who comes to a premature end. It is the same in the end, whether there are a hundred years to look back upon, or whether there are only three."

In his book on Marcus Aurelius, Renan * compares his philosophy of resignation with the Nirvâna of the Buddhists. "Like Jesus, Çakya-Mouni, Socrates, Francis of Assisi, and three or four other wise men, Marcus Aurelius was victor over death. He could laugh at it, because it had no longer any meaning for him." But, just as the theories of Buddha became transformed into a religion which promised the immortality of the soul, and as Nirvâna gave way to the Paradise of the Easterns with its delights, so the sceptical resignation of ancient philosophy was vanquished by Christianity with its promises of a future life and immortality.

---

* "Origines du Christianisme," vol. VII., Sixth Edition, p. 483. Paris, 1819.

Thus, in the course of the centuries, philosophy has been drowned in the floods of sentiment and of religious notions, and it has been a labour of Sisyphus to restore reason to humanity. There is the less need to follow the stages of this resurrection, as, in the end, they come to little. For long, philosophical systems set themselves the task of supporting the dogmas of religion by arguments independent of divine revelation. The gods were replaced by philosophy or by matter, and an effort was made to solve the eternal and disquieting problem of death by proving the immortality of the soul.

The philosophers of the early renaissance of human thought accepted the chief religious dogmas as established truth. Plotin regarded the immortality of the soul as a self-evident truth that required no proof He argued against a resurrection of the body, but accepted the transmigration of souls.

Although Spinoza had given up the conception of the immortality of the soul in the ordinary sense, he accepted the Aristotelian idea that " the human spirit could not be destroyed absolutely with the body, but left some eternal remnant." Death, in his view, was a kind of eternal life, a merging with the absolute, a return to the immortal and universal substance.

Philosophers have exhausted themselves in the study of the foundations of human knowledge with the sole object of demonstrating the truth of religious dogmas. In spite of his scepticism, Kant tried to prove the genuineness of human knowledge, and to found on that a conviction of the future life and of the existence of God. Fichte set himself the same task, but he was forced to recognise that "immortality cannot be deduced from natural phenomena," and that it "is supernatural." "Although we cannot understand the possibility of eternal life, it still may be possible, for it transcends human knowledge." Hegel reached a pantheistic conclusion and believed in the human soul being re-absorbed by the absolute.

These idealistic systems, when they reached their final point, provoked a reaction consisting in the rejection of all formulas based on speculation. They were succeeded by a dogmatic materialism, which in its turn gave place to a sceptical positivism, or rather to a form of agnosticism. Granted the impossibility of belief in the immortality of the soul or in eternal life in any shape, the philosophy regarding death was reduced to the stoical idea that our end is in harmony with the laws of nature, and that it must therefore be accepted without protest. Resignation, therefore, in the fullest sense of the word, became the watchword of human wisdom.

It was only to be expected that certain courageous and independent thinkers should not agree with this conclusion, and attempt to discover some other solution of the great problem absorbing mankind. Thence arose pessimism, the philosophic theory which became so prevalent during the last century, and which claims so many adherents in the present day. Pessimism, like belief in the immortality of the soul and the advocacy of resignation to the evils which beset humanity, is the product of the East, and India was probably its nursery. A pessimistic view of life is a salient feature of Brahminism, but Buddhism develops even more fully the doctrine that everything of this world is evil. That "life is made up of suffering is the inexhaustible theme which, whether in the shape of philosophical argument, or in the more attractive form of poetry, the Buddhist Scriptures din ceaselessly in our ears.*

In Europe, the lyrical poets introduced the pessimistic conception of the world, attracted by its emotional appeal. At the beginning of the nineteenth century, Byron struck this sad note, and expressed the view in the clearest fashion, that if we weighed our hours of joy against our days of pain, we should perceive clearly that whatever our life had been it were better not have been. In the following lines his conception of life is apparent :—

> "Our life is a false nature,—'tis not in
> The harmony of things, this hard decree,
> This uneradicable taint of sin,
> This boundless Upas, this all-blasting tree,
>
> Whose root is earth, whose leaves and branches be
> The skies, which rain their plagues on men like dew—
> Disease, death, bondage—all the woes we see—
> And, worse, the woes we see not—which throbs through
> The immedicable soul, with heart-aches ever new."
>
> "EUTHANASIA."

In chap. vi. I showed that Byron was haunted by a fear of death which ultimately led him to a recognition of the instinctive character of the feeling. He, however, like the other pessimistic poets (Leopardi), did not regard the world as being merely part of a universal system, and it was left to philosophy to come to this conclusion.

During the first half of the nineteenth century, Schopenhauer endeavoured to give a presentation of a pessimistic theory, borrowed from Hindoo religions and from the views of contemporary poets, in the form of a rational philosophy.

---

* Oldenberg, *loc. cit.* p. 215.

He developed a conception of life according to which "existence is to be regarded as something one is better without, as a kind of mistake which should be remedied when recognised." * According to Schopenhauer existence is wrong, and results from the gratification of unrestrained desire. "If an attempt be made to realise the amount of misery, pain, and evil of all kinds, that the sun shines upon in its daily course, it will be seen how much better it would be were the earth to exhibit as few phenomena of life as the moon, and if the surface of the earth were in a similarly crystallised condition. Human life might equally be interpreted as a useless disturbance of the exquisite tranquillity of nothingness," the meaning of the disturbance being wrapped in impenetrable mystery.†

This melancholy state of life was the result of the cosmic process, which has created so much evil, and which finally evolved the human species, capable of feeling and appreciating to the full the pain of the world. The lower animals he regards as happier than man, their senses being less fully developed, and being unconscious of the worst aspects of their existence. In man, pleasure is purely a negation, whereas the sensation of pain is passive, contemplation, a human monopoly, rendering suffering still more unbearable. "Man's capacity for pain increases far more with the passage of time than does his capacity for enjoyment, and is especially increased by his foreknowledge of death. Animals only fear death from instinct, without having any real knowledge of it, and without having the prospect of it always before their eyes, as is the case with human beings." ‡ Schopenhauer was convinced that happiness should not be regarded as the aim of life. "The greatest mistake we

---

* "Parerga und Paralipomena," *Edition Reclam.*, vol. II., p. 267.

† *Ibid.* p. 253. ‡ *Ibid.* p. 251.

can make," he said in his principal work,* "is to imagine that we are placed here to be happy." "So long as we continue in this erroneous view which optimistic doctrines serve to foster, the world will continue to seem a mass of contradictions to us." "It would be nearer the truth to regard pain as the aim of life rather than pleasure." "The destiny of all human existence seems to be suffering. Life is wrapped about with evil, and cannot be protected from it. Life, at its very beginning, is signalised by tears, its course is fundamentally tragic, and still more tragic is its end. It is impossible to ignore that all this is meant to be." "Death is the real goal of life. Its attainment brings a solution of all that has gone before."

The prospect and expectation of death, being products of reason, are experienced by men and not by animals. "Only in the case of humanity is the will capable of renouncing and withdrawing from life."

What is the answer to all these contradictions and the explanation of a cosmic process which on the one hand leads but to death, and on the other hand develops the intelligence so as to enable it to fear and dread the inevitable end? Is the solution to be found in belief in the immortality of the soul, supported as it is not only by nearly every form of religion, but by numerous systems of philosophy? Schopenhauer devotes many pages to the discussion of this question. He neither supports the doctrine of the resurrection of the body, nor the immortality of the conscious soul. "Just as the individual has no memory of pre-natal existence, so after death he will remember nothing of his present life." † "Those who regard birth as the actual beginning of man's life must necessarily face death as final, the two being parallel. No man can therefore regard himself as immortal without forfeiting his belief in his own birth. Birth and death have the same origin and the same significance. They represent but one line, extending in opposite directions. If birth implies an origin from nothingness, then death must be complete annihilation." *

---

* "Die Welt als Wille und Vorstellung," vol. II., p. 726, Leipzig.

† *Loc. cit.* vol. II., p. 730.

There is no such thing as individual immortality. But, according to Schopenhauer, to desire such immortality would merely be to advocate "the eternal perpetuation of a great mistake. Each individual existence is a definite mistake, a blunder, something that would better not have been, and the object of existence should be to end it." †

But if man, as an individual, is mortal, "death only takes away what was given by birth, that is to say, the principle by which death itself became possible." ‡ "Consciousness ceases at death, but the cause which produced that consciousness persists; life comes to an end, but not the principle which became manifest by life." §

What then is this immortal principle? It is the idea of the species or genus. Men or dogs, as individuals, perish in due course, but the human species or the canine species, the man "idea" or the dog "idea," endures. Here Schopenhauer reverted to the conception of Spinoza, who, indeed, denied the immortality of the soul, but none the less believed in the immortality of the principle of life. This everlasting principle, according to Schopenhauer, is the will in its widest and most metaphysical sense, while, on the other hand, the mortal soul is the reason, a product of the functions of the brain.

The eternal principle of life cannot be defined, because "we cannot pass outside the limits of our consciousness.

---

* "Die Welt als Wille und Vorstellung," vol. II., p. 555, Leipzig.

† *Loc. cit.* p. 561. ‡ *Loc. cit.* p. 564. § *Loc. cit.* p. 566.

And thus the problem of what it is in itself cannot be resolved." *

Schopenhauer himself recognises that this solution of the problem is not satisfactory from the point of view of those who desire reassurance of their immortality. "But," he continues, "it is better than nothing, for those who dread death from the point of view of absolute annihilation should not despise the certainty of the persistence of the most vital principle of life." † He further remarks that it must be remembered that nature is interested only in the preservation of the species, being indifferent to the individual. We ourselves being only a part of nature ought to further its plans. "If we wish to attain to a wider knowledge of nature, we must place ourselves more in sympathy with it, and regard life and death indifferently." ‡ Schopenhauer himself feels that his theories and arguments are unsatisfactory. When he had reached the full development of his doctrine, he admitted that it was negative in character, and that it ended in negation. It spoke only of what it had to deny and of what ought to be abandoned. It was obliged to regard as nothingness all that could be acquired in the future. As a consolation, he added that he meant relative nothingness, and not absolute nothingness.

As an ultimate aim, there remained nothing but abrogation of the will to live, and thus misery and wretchedness, which are the inseparable accompaniments of human life, led to resignation.

As our life is no more than a succession of misfortunes, and as, according to Schopenhauer, death is the plain conclusion of philosophy, the end of the individual life must be pleasant. As a general rule, he said, the death of a well-regulated life is calm and peaceful. But the privilege of

---

* *Loc. cit.* p. 566. † *Loc. cit.* p. 537. ‡ *Loc. cit.* p. 540.

dying willingly, with joy and delight, is reserved for him who has learned resignation, and has abolished and abandoned his will to live. For such an one would be willing to die in reality, not merely in appearance, and would neither desire nor claim a personal immortality. He would give up readily the existence that we know. Whatever may replace that existence is nothing from the point of view of individuality. The Buddhistic faith called the position attained by him who had given up the will to live, Nirvâna, or nothingness." *

The natural deduction from this pessimistic doctrine of Schopenhauer would be to abolish the will to live by abolishing our individual life by suicide. But such is not the advice of the philosopher. He is far, however, from agreeing with those who regard suicide as criminal.† He merely does not admit that it solves the question. "He who commits suicide destroys the individual only, and not the species." "Suicide is the voluntary destruction of a solitary phenomenon, without in the smallest degree affecting the system as a whole." ‡

The will to live manifesting itself, according to Schopenhauer, by the creation of new individuals, the philosopher would naturally, in accordance with his views of life, abstain from bringing others into the world. Schopenhauer lived and died a bachelor, and, so far as I am aware, had no childern. On the other hand, convinced that the solution of life's problem did not lie in suicide, he clung tenaciously to life. Having relinquished a belief in the immortality of the soul, he fell back upon a belief in the persistence of some ultimate principle, apart from conscious life, and held that in resignation and desire for annihilation (Nirvâna, according to

---

* *Loc. cit.* p. 581. † "Parerga," vol. II., p. 258.

‡ "Die Welt als Wille," vol. I., p. 472.

his interpretation of the Buddhist doctrines) lay the true consolation for all the evils of human existence.

For a long time Schopenhauer's views found no echo in the opinions of other thinkers. Later, however, they became more and more widely diffused, and philosophic pessimism became quite fashionable. Those who did not adopt the metaphysical principles of Schopenhauer's philosophy agreed with his views on life and on the impossibility of happiness.

Exactly half a century after the publication of Schopenhauer's principal work,* another German philosopher, E. Hartmann,† went a step further in the same direction. Without agreeing wholly with his metaphysics, he shared Schopenhauer's views on the impossibility of regarding happiness as the true aim of existence. In order to demonstrate this theory, he examined the three phases of illusion through which mankind passes. He held that, in the first phase, people imagined happiness to be attainable during the present life. However, all that have been regarded as the sources of joy—youth, health, desire, conjugal love, family love, glory, etc.—end in disillusion. Love itself is especially submitted to Hartmann's implacable criticism. According to him, there can be no question but that "love causes far more suffering than pleasure to those concerned."‡ "It cannot be doubted," he says, "that reason would prompt a total abstention from love," and, as a means to this end, he recommends "the extinction of sexual desire by castration, if that could be relied upon to destroy desire." § That, according to Hartmann, "is the only possible means of securing the happiness of the individual." It is at the sacrifice of his personal happiness that man permits himself to love, and so abets the evolution of the cosmic process

---

* "Die Welt als Wille und Vorstellung."

† "Philosophie des Unbewussten," Berlin, 1869.

‡ *Loc. cit.* p. 560. § *Loc. cit.* p. 565.

When they have become convinced of the impossibility of obtaining happiness in this world, people persuade themselves that it may be obtained after death in a transcendental life in another world. This, however, is only a second phase of illusion, and is based upon faith in life after death and eternity. It is certain, however, that the individuality of the organic body as well as that of the mind is only a delusion which ceases with death." * Hartmann says in conclusion that "it is therefore plain that the hope of the immortality of the individual soul is also a mere illusion. And thus the chief support of the Christian promises is cut away; for men are devoted to their dear selves, and take little interest in a future happiness in which they themselves are to have no share." †

Being disillusioned regarding the possibility of obtaining happiness in this world, or in a future state, humanity falls back upon a third illusion. Firmly convinced that the aim of life is true happiness, man concluded that it was only attainable in some future state of the cosmic process. This hypothesis is based upon belief in a sytsem of progressive development. "This," declares Hartmann, "is yet another mistake. Humanity may progress as much as it likes," he says, "but it will never succeed in suppressing or even diminishing the greatest evils which beset it: disease, old age, dependence on the wishes or the power of others, misery and discontent. Notwithstanding the new remedies which are discovered, the number of diseases, especially those of a chronic nature which are so trying, continues to increase at a rate that medicine cannot keep pace with. Joyous youth will always constitute a small portion of

---

* *Loc. cit.* p. 603.

† *Loc. cit.* p. 606.

humanity, while the greater part will consist of melancholy old age." *

Against this idea that the happiness of the race will be the eventual result of progress, Hartmann employs the following arguments: "The happiest people are those who are the rudest and most primitive, and, among civilised races, the uneducated classes. It is well known that the progress of education increases discontent. The progress of science contributes little or nothing to the absolute happiness of the world. Practically speaking, this progress is of advantage to politics, social life, morality, and the arts; but factories, steam-boats, railways, and telegraphs, have so far done no positive good to humanity." † Hartmann frequently recurs to the conclusion that the primitive are happier than the civilised, and that "the lower classes, inferior and rude, are happier than the rich who are well educated and great; that idiots are happier than the intelligent, and that, as a general rule, the less sensitive a man's nervous system may be, the happier he is, as his capacity for feeling pain is not so much in excess of his capacity for enjoyment, and his illusion is therefore greater. With the progressive development of humanity, however, not only is there an increase in the extent of human needs, but in the sensitiveness of the nervous system, and in the cultivation of the mind. In consequence, the balance of pain over pleasure increases, and the illusion is destroyed, that is to say, knowledge comes of the misery of life, of the vanity of most of the pleasures. Misery itself increases as much as knowledge of misery, as experience has shown; and the apparent increase of happiness in the world, due to the progress of universe, is merely superficial.

Having reached this extremely pessimistic conclusion, that

---

* *Loc. cit.* p. 615.

† *Loc. cit.* p. 621.

it is impossible for humanity to attain happiness, Hartmann proceeds to inquire into the real destiny of man. He would be no true philosopher if he did not hold that the world was created according to a general plan, and that it follows a regular course tending towards a definite end. "We have seen," he says, "how that in the present world all has been arranged in the wisest, and for the most part the best way, and that it should therefore be regarded as the best possible of worlds. Notwithstanding this, however, it is supremely miserable, and worse than if it did not exist at all."

Being convinced of the illusory nature of its hopes, humanity "must definitely renounce all pretensions to positive happiness, and aspire only to a freedom from pain, to annihilation or Nirvâna. This, however, must not be merely the attitude of solitary individuals, but humanity at large must cry out for annihilation. This is the only possible outcome of the third and last phase of illusion."

By what means is this end to be attained? Hartmann is no advocate of suicide as the best remedy of the evils of human existence. Upon this point he agrees with Schopenhauer, and thinks that such a course would have no effect upon the general progress of the cosmic process. A renunciation of pleasure—asceticism—would present no better solution of the problem. Even abstinence from reproduction would not serve the purpose. "What good would it do," says Hartmann, "if humanity were to cease to be by means of sexual abstinence? This unfortunate universe would continue to exist, and the Unconscious would immediately take advantage of the opportunity to create a new man or some other similar type." * Thus it is not the disappearance of mankind that should constitute our aim, but "the complete abandonment of the individual to

---

* *Loc. cit.* p. 636.

the cosmic process, in order that the latter may accomplish its end and bring about the universal deliverance of the world."[*] This being so, the instinctive love of life reasserts itself, and it becomes necessary to admit, at least as provisional truth, "the validity of the will to live; for it is only by complete resignation to life and its troubles, and not by cowardly renunciation and abandonment, that one may contribute one's share in the development of the cosmic process."[†]

Hartmann's proposed solution of the problem of human existence belongs undoubtedly to the category of systems advocating resignation. He is unable to tell us what is the cosmic process to which he bids man lend all his forces. He advises humanity to continue to live and to multiply in the full certainty that happiness cannot be attained. Hartmann obviously demands a true renunciation and an absolute submission. His solution has the appearance of being more exact, and of furnishing a guide to human conduct more clear than that vague aspiration to Nirvâna proposed by Schopenhauer. But on closer investigation it becomes at once plain that the greater precision is illusory.

It is easy to see, under such circumstances, that a school of criticism or negation of the pessimistic doctrines should have gained many adherents. Very few, on the other hand, have embraced pessimistic doctrines because of any power being inherent in them to resolve the difficulties of life. A German pessimistic philosopher, Mailaender,[‡] shared fully Schopenhauer's opinions as to the misery of human life, but opposed the latter's doctrine of resignation and Nirvâna as the solution of the general problem of life.

---

[*] *Loc. cit.* p. 638.

[†] *Loc. cit.* p. 638.

[‡] "Die Philosophie der Erlösung," 2 vols. Third Edition. Frankfort, 1894.

Mailaender accepted the three stages of human illusion as expounded by Hartmann, but attacked vigorously the view of facilitating the cosmic process by acquiescence in the will to live. "Indeed," he cried, "your advice is that we should sacrifice ourselves to the cosmos, we are to choose a career, to learn a trade, acquire money, property, fame, power, and so forth; we are to marry and to beget offspring; by such advice you are merely undoing with your own hands the sole merit of your work, the analysis of illusion. You suddenly advise the very man who has got behind all these illusions to succumb to them again, as if an illusion, although it has been recognised, could still deceive and exercise its power." *

Mailaender takes an entirely different view of the problem. Like his predecessors, he is convinced of the futility of happiness, but he has achieved an original view of the cosmic process. He holds that an unaccountable and divine Being existed before the creation of the world. Before disappearing "this divinity gave birth to the universe." By this means, complete annihilation was made possible. "The world," says Mailaender, "is but the means for bringing about a condition of non-existence, and is the only possible means by which that end could be attained. God knew that only by creating a real world could we pass from existence into non-existence." Maileander regards as certain "that the universe tends towards universal non-existence." † This tendency is characterised by the weakening of the total amount of energy, so that "every individual at the close of the weakening process to which his energy is submitted, is led in the course of his development to the point at which his desire for annihilation may be fulfilled." ‡

---

* *Loc. cit.* vol. II., p. 637.

† *Loc. cit.* vol. I., p. 325.

‡ *Loc. cit.* p. 327.

Life on our planet, he says, ought to be regarded as a halting-place on the road to death. In order to appreciate fully the happiness brought by death, it is necessary first to taste of life, and that is why the instinct of self-preservation is so well developed in animals. Man passes first through a phase of development in which he is like any other animal. "As with them, the will to live is stronger than the will to die. Life is clung to with extreme pertinacity, and death is proportionately execrated." "At first, not only the fear of death increases, but equally the love of life. Terror of death becomes acuter. Animals, knowing nothing of death, only fear it instinctively through their perception of approaching danger. Man, on the contrary, knows of the existence of death and what it means. He looks back on his past life and wonders what the future may hold in store, and realises, infinitely more than animals realise it, the dangers that threaten him. During this phase, man does all in his power to keep death at bay, and to make his life as happy as possible. This, however, is not the last stage of his development. The thinking man soon comes to the conclusion that a craving for life is not the true aim of the universe ; it is only the means for attaining to a knowledge of the definite aim of existence, which is the cessation of life. Philosophy soon shows that perfect happiness is not possible, and that only death is really desirable. In summing up the cosmic process, the conclusion arrived at is "that throughout the universe the desire of death exists in a form more or less masked, but that in the organic world this assumes the form of a will to live." * In the end, however, the desire of death becomes more and more plain, until the philosopher can see "in the whole universe nothing but a longing for absolute extinction, and fancies that he can hear the cry

---

* *Loc. cit.* p. 334.

rolling from star to star, 'Deliverance, deliverance, death to our life!' and the echoing cry of consolation, 'Extinction and deliverance await you all!'" *

In order to explain in a clearer way the progress of this evolution, Mailaender describes the state of mind of a man who develops the will to die, and commits suicide. "At first he glances anxiously and from afar at death, and shrinks from it with horror. Later, he draws nearer and walks round it in wide circles. Day by day, however, these circles become smaller, until finally he embraces Death with weary arms and looks it straight in the face. Then Peace comes; gentle Peace!" †

It is absurd to expect anything to follow death but absolute annihilation, and the ordinary man faces this prospect with terror. "But it is essential," says Mailaender, "that man should dominate the universe by knowledge, and wise men look forward to total annihilation with joy." ‡ "In relinquishing Schopenhauer's will to live," concluded Mailaender, "I have finally arrived at the will to die. I have raised myself upon the shoulders of Schopenhauer, until I have attained a point of view such as others have never accomplished. At present I am alone, but behind me all humanity is pressing on to freedom; and before me is the clear translucent vista of the future." §

I have quoted these views, not because of the solidity of Mailaender's arguments, but merely because this pessimistic philosopher proved himself to be more consistent than his predecessors. While Schopenhauer and Hartmann, both so firmly convinced of the non-existence of happiness and the vast preponderance of suffering in all imaginable conditions of life, lived out their lives,

---

* *Loc. cit.* p. 335.

† *Loc. cit.* p. 349.

‡ *Loc. cit.* p. 358.

§ *Loc. cit.* vol. II., p. 242.

Mailaender, true to his principles, committed suicide when barely thirty-five years of age.

This is probably not a solitary instance. Under the influence of pessimism, a certain number of young persons, especially those whose mental equilibrium is not very firmly established, follow in the tragic footsteps of Mailaender. Some commit suicide, while others abstain from taking part in the perpetuation of the race. Others, but these are not many, curtail their existence by dissipation, thinking life not worth the care of it.

A modern writer of great talent, Maeterlinck, echoes the pessimism of the present generation. "It is plain," he says,* "that from one point of view humanity will always seem wretched, and as though being dragged towards a fatal precipice, since it will ever be doomed to disease, to the inconstancy of matter, to old age and to death." "Yes, human life as a whole is sad, and it is easier, I may almost say pleasanter, to discuss and expose its dark side, than to enumerate its consolations and make the best of them. The miseries of life are many, obvious, and never failing; whereas the consolations, or rather the reasons which cause us to fulfil with alacrity the duty of living, are rare, hard to seek, and precarious."

Although pessimism has been greatly developed and widely spread during the nineteenth century, dissentient voices in opposition to this negative attitude towards the things of this world have not been wanting. Take the views of the German poet, Robert Hammerling,† who reproaches the pessimistic philosophers with ignoring the attitude of mind of the majority of mankind who ask but one thing,—life—

---

* "Le Temple Enseveli," 1902.

† Quoted by Steiner, "Welt und Lebensanschauungen im XIX. "Jahrhundert," 1901. Vol. II., pp. 170–173.

life at any price and under any conditions. Against this sentiment all dogmatic arguments are useless, for, according to Hammerling, the question of pleasure and pain is a matter of feeling and not of reason. Now, with regard to the general feeling of humanity, there can be no doubt—it is frankly optimistic.

Max Nordau, the well-known writer, supports a similar theory. According to him, all living nature betrays its optimistic foundation. "The truth is," he says, "that optimism, limitless and irradicable optimism, constitutes the fundamental attitude of man, and is the instinctive feeling which governs him under all circumstances. All other forms of life confirm this truth. . . ." "All nature," according to Max Nordau, "by the bells of flowers and the throats of her birds, rings and proclaims the truth of optimism." "No animals feel the pain of the world; and our own ancestor, the contemporary of the cave bear, was certainly free from all anxiety relating to the destiny of the human race."

These arguments do not take into account that, to be true, pessimism need not necessarily be felt and agreed with by all living creatures. Birds and other animals, happy in their lives, that is to say optimists, know nothing of the inevitability of death. Our cave ancestors knew nothing of it either. If the greater portion of modern humanity is optimistic, that might be accounted for by its being still under the influence of one of the three phases of illusion alluded to by Hartmann. It is only when the highest stage of development is reached that man, being convinced of the futility of his hopes, arrives at a pessimistic conception of the universe.

Max Nordau disclaims discipleship of Doctor Pangloss, who held that the world is the best of all possible worlds. But his arguments reveal a pronounced optimism. He regards pain as an indispensable factor of the maintenance of life. "Without pain," he says, "our lives would not endure an hour, for we should be unable to recognise dangerous symptoms and guard against them." Insensibility to pain is often so grave a symptom that sick people rejoice when they are again able to feel the prick of a needle.

This is true enough, but none the less the feeling of pain is very erratic in both animals and human beings. Quite insignificant causes and unimportant illnesses, such as certain forms of neuralgia, give rise to unbearable agony. A physiological phenomenon such as childbirth is often attended by extremely violent pain which is absolutely useless as a danger-signal. On the other hand, some of the most dangerous diseases, such as cancer or kidney disease, may exist for a long time without causing any sensation of pain, with the result that the sufferer knows nothing of the presence of the disease until it is too late. Were pain to play the part assigned to it by Nordau, it would appear in all cases of danger, and yet would never become almost unbearably acute.

But when men have passed through the three stages of illusion it is not physical pain which presses most heavily on them. Max Nordau himself admits that it is "appalling to think of the cessation of our consciousness, and the annihilation of our ego." None the less, he believes "that we are so happily constituted as to be able to accept the really inevitable with a light heart, and that there is no ill feeling about the matter." This admission is not in accordance with the well-established facts discussed in chap. vi. With very rare exceptions man does not willingly accept the prospect of death, especially if he be still under the influence of illusion in any of its three stages. As a rule those who desire to live feel not only a repugnance to the contemplation of death, but death seems to them something abnormal and irrational. It is no answer to assert that all who feel this are psychopaths, or that it is absurd to think that the happiness of mankind counts for something in the cosmic process. On the contrary, it is quite natural that man should seek after happiness, and that he should try to analyse the phenomena taking place within him and around him from the point of view of that ideal. For this reason it is quite unjust to say that pessimism cannot be treated seriously. It is pessimism which has been the first to draw up a true indictment of human nature, and if pain is to be regarded as useful in its quality of danger-signal we should equally recognise that the pessimistic view of the universe is a step onwards in the evolution of humanity. Without pessimism we might easily sink into a kind of contented fatalism, and end in quietism, in the manner of many religions.

It is only natural, however, that the thinking world should not accept pessimism as the last word of human wisdom, and that more or less noted philosophers should devote themselves to finding a possible solution of the problem of life and death. These systems of philosophy, one and all, have abandoned readily all belief in future life and personal immortality. But they have adopted pantheistic conceptions, and have accepted the existence of some general principle into which the individual consciousness will eventually be absorbed. There is division of opinion as to the properties of this principle. For some it is the Idea, for others Will, for others Force, or Eternal Energy.* The nomenclature is the less important as the views as to the nature of the general principle are absolutely vague. Accordingly this part of the philosophic doctrines appears in a lyrical form and has passed over into the domain of poetry.

---

* Herbert Spencer.

German poets have helped to spread pantheistic conceptions very widely. I need hardly mention Goethe, whose ideas were purely those of Spinoza, but Schiller's well-known lines are precise :—

"Vor dem Tode erschrickst Du? Du wünschest unsterblich zu leben?
Leb im gazen! Wenn du lange dahin bist, es bleibt!"

"Do you shrink from approaching Death? and crave immortality?
Live on in the All! Long after you vanish the All will remain!"

Rückert, in lines almost equally well known, expresses the same idea :—

"Vernichtung weht dich an, so lang Du Einzler bist.
O, fühl' im ganzen Dich, das unvernichtbar ist."

"Annihilation fills you with terror, because you are self-centred. You must feel your unity with the All, which is indestructible."

A volume might be filled with the attempts of thinkers of different countries to present these poetical ideas in a form less vague and more philosophical. I shall select only a few of the more modern instances.

Renan's * ideas may be taken as typical of the compromise between poetry and philosophy. Speaking of immortality, he said "that we shall each live again by the traces we leave on the bosom of the Infinite." †

The views elaborated by Guyau ‡ are equally poetic. Like so many others he is unable to accept without protest the prospect of the inevitability of death. Brought face to face with this end, he declares that he feels "not sorrow but indignation, as against an injustice of nature." "It is with justice," he cries, "that we look on nature as a murderess

---

* "Dialogues et Fragments philosophiques," Paris, 1876.

† *Loc. cit.* p. 139.

‡ "L'Irréligion de l'Avenir." Sixth Edition, Paris, 1895.

if she kills what is morally best in ourselves and in others." *

It is chiefly in the name of love that Guyau protests against death: "The death of others, the annihilation of those we love, is insupportable to men, who are essentially thinking and loving creatures." †

This problem, so vast and so difficult to solve, is presented by him as follows: "As regards the question of individual immortality, human thought is dragged in opposite directions by two great forces—science, in the name of evolution, prepared to sacrifice the individual completely; love, in the name of an evolution, morally and socially higher, which would preserve the individual at all hazards. There is no more disturbing dilemma proposed to the philosopher." ‡

Guyau hopes that in the course of evolution there will come about a merging of individual consciousness in the consciousness of the whole. "One may ask," he says, "if it may not be that these conscious entities mingling and interpenetrating, may come to live on from one to the other, and so to acquire a new duration?" On such a hypothesis he can foresee "an epoch not, indeed, certain to come, but far from inconceivable, in which individual consciousnesses will have achieved a corporate integrity and a complex intercommunion, without themselves being lost by the union." §

On this hypothesis, "the problem is to be at the same time loving enough and loved enough to live and endure in another. ‖ . . . Those who vanish and those who remain must love one another so greatly that the shadows cast by them on the universal consciousness are identical." "We

---

* *Loc. cit.* p. 462.

† *Loc. cit.* p. 462.

‡ *Loc. cit.* p. 464.

§ *Loc. cit.* p. 470.

‖ *Loc. cit.* p. 471.

should then feel ourselves passing and ascending from this life to an immortality of love," and "the point of contact between life and immortality would be discovered." *

A solution recently offered by Finot † is much less poetical. According to him, it is only "when death is conceived of as annihilation that it is repugnant. On the other hand, if we regard it merely as a change of life, we shall cease to fear it, and even come to love it." ‡

But what is this "change of life" that is to prove so consoling? It is the "immortality of the body," that is to say, the life of the creatures developed at the expense of the human body. "Flies begin the work of the labourers on the dead," giving birth to worm-like larvæ that writhe in the decomposing flesh. The same vermin that horrified Tolstoi when he thought of his own death (see chap. vi. p. 123) became Finot's symbol of consolation. He describes the whole succession of the fauna of corpses, and concludes by saying, "and so goes on the routine of life, from birth to the tomb, of noisy, clamorous life, ceaselessly renewed. Ever loving, giving birth, living and dying. The peace of the tomb is as filled with life as the dust into which we think our bodies will fall." §

I have given the above quotation as an instance showing to what lengths men have gone in their search for a solution of the problem of death and in their desire for a gleam of hope that the end may not be final. I need not say that this idea of the fauna of the corpse has no place in the philosophy of death. Thinkers, no doubt, would prefer the most vague ambiguities to certainties of such a nature. Most contemporary philosophers regard the problem in a very different fashion.

---

* *Loc. cit.* p. 472. † "La Philosophie de la Longévité," Paris, 1900.
‡ *Loc. cit.* p. 307. § *Loc. cit.* p. 105.

In my opinion, Meyer-Benfey, a scholar at Göttingen, has summed up the present condition of the problem very clearly and exactly, in essays on Modern Religion.* He realises that it is impossible to accept the immortality of the soul. Personality must utterly and inevitably perish. But, just as no single atom of our bodies can be annihilated, so "no parts of our souls can be lost." Our actions during life leave traces so much the deeper as the life has been fuller. It is this reuniting "of the actions of individuals with the life of the whole of humanity, that constitutes the true immortality or Nirvâna." He says, too, "In accustoming our minds to this thought, and in educating ourselves with a view to the accomplishment of this end, lies the only possible means of overcoming the fear of death and the terror of annihilation."

Meyer-Benfey is of the pessimistic opinion that happiness cannot possibly be regarded as the supreme end of humanity, for he thinks, if that were so, the whole course of evolution would have been a mistake. It would have been much better had evolution been arrested before the creation of the human race, since animals, being unaware of the inevitability of death, are undoubtedly happier than man. As, however, we have passed through the animal stage and reached the human stage, and achieved some measure of civilisation, and this not by our own desire, or as the result of mere chance, but guided by the inner workings of our nature, it is plain that the ultimate goal towards which we are advancing, must be some other than mere happiness. There can be no question but that the goal is the triumph of pure and perfect culture.

This idea, that the goal of humanity is progress in all its manifestations, is no recent theory, and many definitions of this progress have been advanced, but so far none have been generally accepted as satisfactory. The term "culture," though vague, will have to continue in use until some better word conveying a more precise meaning is found to replace it.

---

* "Die moderne Religion." Leipzig, 1902. See also *Frankfurter Zeitung*, Feb. 19 and 20, 1902.

On reviewing all the systems of philosophy which have attempted so strenuously to solve the problem of individual death, it becomes plain that all, or nearly all, of them deny the existence of a future life and the immortality of the soul. The greater part of them, however, admit some general principle incomprehensible but eternal, which will eventually incorporate within itself all individual souls. Feeling that these vague ideas are incapable of conveying consolation to poor humanity in its fear of annihilation through death, philosophers have persistently taught the advantages of resignation. Even Guyau, realising that his philosophy regarding the immortality of love fails to reassure those who look to philosophy for some word of consolation, ends by admitting that "as there is no help to be expected from the inexorable, nor mercy from that which is in conformity with the universe and even with our own judgment, resignation is best." * As it is the general opinion that to be philosophical is to take things as they are, without undue protest, the watchword of all systems of philosophy is to bow to the inevitable, that is to say, to be resigned to the prospect of annihilation.

---

* *Loc. cit.* p. 476.

PART III

WHAT SCIENCE IS ABLE TO DO TO ALLEVIATE THE DISHARMONIES OF THE HUMAN CONSTITUTION

CHAPTER IX

WHAT SCIENCE CAN DO AGAINST DISEASE

Formation of the experimental method—The intervention of religion in disease—Disease as a basis of pessimistic systems of philosophy—Advance of medical science in the war against disease—The revolution in medicine and surgery due to the discoveries of Pasteur—The beneficial results of Serum Therapy in the war against infectious diseases—Failure of science to cure tuberculosis and malignant tumours—Protests against the advance of science—Opposition of Rousseau, Tolstoi, and Brunetière—Proclamation of the fallibility of science—Return to religion and mysticism

SCIENCE, the youngest daughter of knowledge, has begun to investigate the great problems affecting humanity The chief religions and many systems of philosophy had been long established before the spirit of scepticism dared to inquire whether or no these products of the human mind were really in harmony with fact. Scepticism gained ground little by little, and open war was declared between religious dogma and authority on the one side, and scientific reason on the other.

The great religions and the philosophy of Aristotle had ruled a majority of mankind for some twenty centuries before doubt was cast on the real value of these doctrines.

Francis Bacon, Lord Verulam, asked why it was that all the systems of his time were so vague and so powerless to explain the phenomena of the world. The cause could not lie in nature herself, for without doubt she followed laws that were immutable and that could be subjected to exact observation; nor could it lie in any want of intelligence in those men who devoted themselves to solve the problems. The true cause of the failure lay in the falsity or insufficiency of the methods employed. Bacon, trying to provide a remedy for this condition of affairs, advised that makers of generalisations should proceed very slowly, passing only by the smallest stages from particular facts to conclusions only more general in the slightest degree, and so on, until the ultimate formula might be reached. By such a path it was possible to attain principles neither vague nor ambiguous, but clear and exact and that would not be denied by nature herself.

The first steps taken by science according to this method, which indeed had been suggested long ago, but which was first clearly laid down by Bacon, were slow and halting. Religious and philosophical doctrines still weighed heavily on inquiring minds, so that the new method was not followed with any great courage. None the less progress was achieved, until at length the great problems of humanity opened out. More than two thousand years before the birth of exact science, Buddha had given voice to the chief grievances of the human race. "Behold, O monks, the holy truth as to suffering," he had proclaimed in the Sermon at Benares, "birth is suffering, old age is suffering, disease is suffering, and death is suffering." Science, in its slow progress, passing from particular to general, reached first one of these four sorrows, the suffering due to disease.

In the Buddhist legend that I quoted in chap. vi., the sight of a sick man "whose senses were weakened, who drew his breath with difficulty, whose limbs were shrivelled, whose bowels were wrung with pain, and his body pitifully soiled with excrement," suggested to Buddha the reflection that "health is no more than the idle vision of a dream while fear and disease are horrible realities. What wise man, having seen the thing that life is, can still think of joy or of pleasure? Woe upon health which is assailed by so many maladies." When Buddha, who was a young prince, asked of his father the gift "that he might always remain full of health, and that he should be smitten by no disease," his father, who was the king, replied: "You ask me what is impossible; in that my son, I can do nothing."

From that day, every religion has busied itself with the cure and prevention of disease. They believed that the causes of these were the influence of evil spirits or the visitations of God; and as remedies they prescribed sacrifice and prayer and anything that might avert the anger of God. Even at the present day, similar medicine is used by primitive races. In Sumatra for instance, when it is impossible to arrest the flow of blood from a wound, the disaster is ascribed to an evil spirit (Polasièq) who is sucking the wound and making it incurable. In Nias, when bleeding from the nose occurs in children, it is supposed to be due to the father having killed a cock during the pregnancy of the mother. The indispensable remedy is to make sacrifice to the outraged deity.

No doubt there co-exist with such practices of primitive races, certain useful rules, based on correct observation or on experience. It is a common practice to try all manner of remedies on the sick; although most do harm, now and again something useful may be discovered. Such vulgar medicine has undoubted merit, but it cannot be compared with the results of scientific medicine, which are drawn from rigorous experiment.

Medical science has been slow in developing, but it has now reached a condition of which humanity may be proud. It is outside my purpose to give a long exposition of this subject; but it is necessary to my argument to set out a few facts from which the reader may judge of the present condition of medical science.

Without doubt the fear of disease has played a large part in the pessimistic conceptions of the universe. Not only the words of Buddha that I have quoted, but many of the systems of pessimistic philosophy attest this I have already stated in chap. vi. that Schopenhauer in 1831 was driven from Berlin to Frankfurt by fear of cholera.

In his statement of the case against this universe, and as a chief argument for his proposition that "this is the worst of possible worlds" Schopenhauer adduced the spreading of epidemics. "An alteration of the atmosphere so slight that it cannot be detected by chemistry brings about cholera, or yellow fever, or the black death, diseases which number their victims by millions; an alteration slightly greater might destroy all life."*

Hartmann, who has been one of the chief advocates of Schopenhauer's pessimism, also had gloomy views on diseases and medicine. He was convinced that howsoever great the progress of humanity might come to be, there never would be an end or even a diminution of diseases. "It is no matter," he said, "how many remedies may be discovered for diseases; new diseases, and particularly chronic affections which, although not serious are extremely painful, will continue to appear more rapidly than the discoveries of medicine."†

Humanity will be fortunate if the pessimistic philosophers prove as wrong about their other grievances as they have proved about disease and medicine. To understand the vast progress made by medicine, it is necessary only to compare the complaint of Schopenhauer with the actual state of affairs. When he spoke of epidemics being due to slight changes of the atmosphere, Schopenhauer obviously was repeating the medical opinion current in his times. Experimental science has proved that he was quite wrong. It has been shown conclusively that two of the great affections of which he spoke, cholera and plague, are due not to chemical changes in the air, but to definite microbes, the natural history of which is known as well as that of any other plant. Cholera is produced by the vibrio, discovered by Koch, a minute organism that lives in water and that enters the human alimentary canal with food or drink. We do not yet know a definite cure for cholera, but we do know how to prevent infection. The most simple mode of guarding against infection is to swallow only material that has been boiled, and to prevent contamination of water or of vessels with fæcal matter containing the Koch's vibrio. Moreover, in individual cases use may be made of anti-cholera serums. In 1831, if these discoveries had been made, philosophy would have taken a different course. Instead of trembling at the epidemic, and flying to Frankfurt, Schopenhauer would have remained quietly at Berlin, and Hegel would not have ceased to develop his idealism in the university of that town.

---

* "Die Welt als Wille und Vorstellung," vol. II., p. 687.

† "Philosophie des Unbewussten," p. 615.

Schopenhauer enforced his argument by reference to the black death "capable of destroying millions of victims." It is certain that the black death was no other than human plague, which made enormous ravages, in the fourteenth century, for instance, destroying nearly a third of the population of Europe. In those days, no one doubted but that it was a visitation of the Divine wrath, and people gathered in churches to make common supplication. Sacrifices were offered and flagellations took place in the hope of averting the terrible malady. Travellers who have been in the capital of Austria must have seen in one of the chief streets (Graben) a large and unlovely monument, erected in the seventeenth century to commemorate the interposition of Providence in staying one of the great epidemics of plague. Now that science has made known the true cause of plague, our ideas as to the causes of the appearance and disappearance of epidemics are very different. Plague is not the manifestation of the anger of God, but is a scourge due to invasion by a minute organism, discovered simultaneously by Kitasato and Yersin in 1894. The natural history of the microbe has been studied, and we know that it may live not only in human bodies but in the bodies of small rodents, such as rats and mice, which live in association with man. These animals are the source of human infection, and it is necessary to destroy them as completely as possible. There is no doubt but that the arrest of the plague in the seventeeth century was due to the fact that rats and mice had themselves been exterminated by the plague.

Plague, which formerly was the most terrible of epidemic diseases, has now become a misfortune against which it is simple to guard ourselves. To secure that end, however, we have not to pray or to scourge ourselves, but to take measures to destroy rats and mice. Moreover serums may be employed ; and the use of these is not only prophylactic, but if the disease be not too advanced, is actually curative. The danger of which Schopenhauer spoke may be regarded as definitely averted, and this is due to the advance of medical knowledge. In such countries as British India in which plague still causes great losses, we have to blame the ignorance of the population. Instead of following the course prescribed by science, these people still prefer the rules laid down by the Brahmanistic religion. Their idea of cleanliness and purity is a religious idea, and not that of medicine and bacteriology. It is not surprising that plague still exists in India, but none the less no case is a better instance of the progress of knowledge.

Hartmann's idea as to a progressive increase in the number of diseases rests on no exact grounds, and is in opposition to much that we know. As a matter of fact, as knowledge of hygiene advances and becomes spread among the peoples, diseases become less frequent and less fatal.

A great stimulus was given to medicine and surgery when there was applied to these the knowledge gained by Pasteur in his study of fermentation. Pasteur showed that fermentations were chemical alterations in organic matter, excited by the presence of minute organisms very common in the neighbourhood of man.

This discovery was applied in the first place to surgery. Lord Lister, then a surgeon in Scotland, showed that the festering of wounds was due to the entrance of minute organisms. Following this clue, he succeeded, by the use of dressings, in preventing the contamination of wounds and at once saw a vast reduction in deaths following surgical operations. Since the discovery of anæsthetics, such as ether, chloroform, and cocaine, and the use of germ-free dressings, surgery has been developed in a marvellous fashion. The varied and delicate feats of abdominal operation are known to all, and recently surgery of the heart has become possible.

A comparison of the mortality of the wounded in the different wars of the nineteenth century affords an excellent means of gauging the progress of surgical treatment of gunshot wounds. The mortality of the wounded among the English troops in the Crimean war reached 15.21 per cent.; in the French troops in Italy in 1859–1860, it was 17.36 per cent.; in the German army in 1870–1871, the years in which antiseptic surgery came into use, it fell to 11.07 per cent.; while in the Spanish-American war in 1898, in the most brilliant period of modern surgery, the percentage mortality of wounded had fallen to 6.64.* In the recent Transvaal war, the mortality was half what it had been in the Franco-German war.†

New medical knowledge, founded on the discovery of the nature of ferments and of the virus of infection, has reformed the practice of midwifery to such an extent that puerperal fever, formerly one of the great scourges of humanity, is now extremely rare.

Blindness acquired at birth, which formerly rendered many lives extremely miserable, is now practically completely prevented, by means of the precautions taken to hinder the child from being contaminated by the mother in the process of birth. The most successful method is that which was suggested by Credé,‡ a German physician, and consists in placing in the pupils of the infant a minute drop of nitrate of silver, which is an antiseptic, and prevents the occurrence of ocular blennorrhagia.

---

* Borden, "The Use of the Röntgen Ray," p. 20. Washington. 1898.

† *Bulletin du Service de Santé Militaire*, No. 499, p. 73. 1901.

‡ The efficacy of Credé's treatment may be inferred from the figures recorded at Stockholm, in which city the adoption of the treatment caused the percentage of cases of this nature to fall from 0.56 in 1891 to 0.045 in 1899. See Widmark, "Mittheilungen a. d. Augenklinik d. Carol. Med. Chir. Instit. zu Stockholm," p. 126. 1902.

Appendicitis, a disease so common that I referred to it in chap. iv. as one of the most salient examples of disharmony in the human constitution, has been resolutely attacked by medical science. In some cases, surgical interference makes a definite end of the disease ; in other cases medical treatment has been enough to subdue the symptoms without recourse to operation.

For a considerable period, those of a sceptical disposition asserted that the advance of bacteriological knowledge was of service only in surgical cases. But Pasteur showed that this was an erroneous view. Working with Chamberland and Roux, Pasteur demonstrated that many infectious diseases could be prevented by the use of attenuated virus ; he succeeded in saving the lives of many animals and of men, bitten by rabid dogs and affected by hydrophobia, a disease formerly almost invariably fatal and among the most horrible to which man is liable.

In the latter direction, medical science is developing at an extraordinary rate, and is achieving results of a remarkable nature. Among recent discoveries, I may mention that of the curative properties of the blood-serum of animals which have been subjected to the action either of microbes or of the soluble products of microbes. Von Behring, working with the Kitasato, a Japanese investigator, has shown that a serum of this nature, prepared with the poison produced by the microbe of diphtheria (the poison was discovered by Roux in collaboration with Yersin), is capable not only of protecting those in good health from diphtheria, but of curing those who have been attacked by the disease. The serum fails to act only when it is employed in advanced cases of diphtheria.

Anti-diphtheritic serum, introduced into medical practice about eight years ago, has been tried in every way and has been proved to possess both preventive and curative properties. If patients still die from diphtheria, it is only because the treatment has been applied too late or insufficiently.

The use of the anti-diphtheritic serum has reduced the mortality in cases of diphtheria from 50 or even 60 per cent. to 12 or 14 per cent. The number of infant lives that have been saved by this method must be enormous.

The beneficent discovery of the curative value of serums has been applied to other diseases and is giving very encouraging results. I cannot go into details here, but it is enough to say that in the last quarter of a century medicine has entered a new epoch, and has taken its place among other exact sciences based on the experimental method. Although it is not surprising that in so short a space of time science has not yet conquered all the ills affecting humanity, this failure has provoked the most severe criticism.

" Indeed," one of the critics has said, " you vaunt the progress of medical science at a time when you have to confess that it has failed to cure tuberculosis, one of the gravest of the infectious diseases, which alone causes the death of a sixth part of the human race." It is true that the infectious nature of this scourge was announced by Villemin more than forty years ago. Twenty years have passed since Koch, the German bacteriologist, discovered the microbe that produces not only the ordinary form of pulmonary consumption but all other varieties of tuberculosis. And we are still ignorant of any remedy for the disease. In all the bacteriological institutes and laboratories search is being made for some vaccine or serum or medicament which will arrest a disease that in many cases nature herself cures. But the results amount practically to nothing.

This is certainly a good example of the failure of science. None the less a closer examination shows that even with the knowledge already gained we could deal with tuberculosis in a manner more efficacious than is the existing practice. When the infectious nature of the disease had been made known, before waiting for the discovery by Koch of the actual bacillus, we should have employed all the known modes of destroying infectious matter. In spite of all that has been said and written on the subject, people still spit on the floors of omnibuses and cars and on street pavements. Tuberculosis is propagated not because of the failure of science, but because of the ignorance and stupidity of the population. To diminish the spread of tuberculosis, of typhoid fever, of dysentery, and of many other diseases, it is necessary only to follow the rules of scientific hygiene, without waiting for specific remedies.

Although the science of to-day is sufficiently armed against the diseases commonly known as infectious, the case is very different with some other affections, among which the chief place is taken by malignant tumours, or cancers, in the most general sense of the word.

There are few maladies more terrible, for they practically never disappear spontaneously, and surgery can remove them successfully only if they have been recognised at an early stage. Every year a number of persons, old and young, die victims of malignant tumours, and it is even possible that cancer is more prevalent now than in former times. It has been suggested that the increase of cancer is due to the greater longevity among modern races, and as malignant tumours are most common in old persons, it may well be that the prolongation of life has given this disease a larger field. However, even allowing for this, it is probable that there is a real increase of cancer.

Unquestionably the malignant tumours are the diseases most disappointing to medicine and surgery, and these sciences are as much at a loss with regard to them as in the case of infectious diseases before the discovery of pathogenic organisms. Science is perhaps even in worse case with regard to cancer than it formerly was with regard to infectious diseases, for, before the discovery of microbes, something was known of the virus which produces infection. Thus the virus of smallpox was known, and was used, by the method of inoculation, to prevent more serious attacks of the disease. Nearly a century before the discoveries of Pasteur, Jenner had been able to be of the greatest service to mankind by his discovery that the virus of cow-pox could be used as a preventive of infection by smallpox.

In the case of malignant tumours, we do not even know their real nature; we are ignorant as to whether or no they are infectious, and whether they are caused by a microbe coming from without or are due to internal changes of the tissues. Our ignorance, however, affords no ground for despair. It is probable that the malignant tumours will soon come to be ranged with infectious diseases due to invasions by specific microbes. Experiments on the cancers in rats and mice have shown that these can be inoculated in the same manner as in the case of the recognised infectious diseases. Hanau has shown that this occurs in the case of epithelioma of old rats; Morau* has succeeded in transferring the cancers of white mice, and his results have been confirmed by Jensen† and Borrel‡, in the Institut Pasteur. These investigations mark the beginning of a new stage in the knowledge of tumours. I am unable to see, therefore that the malignant tumours provide a satisfactory argument in favour of a pessimistic conception of the universe.

---

* "Archives de médecine expérimentale," vol. VI., p. 677. 1894.

† "Hospitalstidende," May 7, 1902, p. 489.

‡ "Annales de l'Institut Pasteur," February 1903.

Dr. Boas, of Berlin,* in a recent publication, has laid stress on the fact that most patients affected with cancer do not seek medical aid until the disease is far advanced. For instance, in 80 per cent. of the cases of cancer of the rectum that he had attended, the patients presented themselves too late for operation. Boas advised that the attention of the public should be drawn, by means of widespread publication, to the earliest symptoms of cancerous disease. He thought that such a course might save many lives by making possible operation in early stages.

The prevention and treatment of disease, which for long was in the hands of religious authorities, is now passing into the care of those who employ the methods of scientific medicine. It is now only in the case of certain nervous maladies, which can be treated by suggestion, that religion has any important part to play. I have not thought it necessary to expound at length the work of science in the struggle against disease, because the evidence on this point is extremely clear and precise. Every one must accept it, and even the passionate enemies of science have to bow before the fact.

However, the problem has been changed. Science they now admit, is capable, no doubt, of assuaging humanity in its sufferings from this or the other disease. But there is another question. Disease is only an episode in human life, and the great problems remain unsolved by science. It is not enough to cure a man of diphtheria or intermittent fever; it is necessary to explain what the destiny of man is, and why he must grow old and die at a time when his desire to live is strongest. Here, plainly, all science must fail, and here must begin the beneficent work of religion and philosophy. But as science is constantly casting doubt on the dogmas of religion, and criticising adversely the systems of philosophy, it is plain, that so far from being of service, science is actually harmful to mankind.

---

* "Deutsche medecin. Wochenschrift," October 30, 1902, p. 798.

The campaign against science was opened long ago. In the eighteenth century Rousseau[*] opened it with brilliancy and zest worthy of his reputation. He defended his theme with vigour and eloquence and the following quotations may serve as an example, "Know O people," he wrote, "that nature has desired to preserve you from science as a mother tries to snatch a dangerous weapon from the hands of her child; that the secrets which she has hidden from you are evils from which she would preserve you, and that one of her greatest gifts is the difficulty with which knowledge is acquired. Human beings are perverse, but they would have been worse had they had the misfortune to be born learned men.[†] Our sciences are futile in so far as they fail to attain their objects, but they are worse than futile in the results that they bring about. Born of idleness, they cherish their mother—Tell me, illustrious philosophers, you from whom we know why matter attracts matter, the relations of the orbits traced by revolving planets, the mathematical properties of curves, what stars may be inhabited, what insects exhibit curious modes of reproduction; tell me, I say, you from whom we have gained such marvellous information, if you had never learned of these things, should we have been less numerous, less well governed, less flourishing, or worse disposed?"[‡]

Such words were capable of impressing men because of their eloquence and sincerity, but they could not arrest the continued and triumphant advance of science, which indeed, precisely at the end of the eighteenth century, began its modern and lasting progress. For it was then that Laplace described the system of the heavens and that Lavoisier laid the foundation of modern chemistry and of our knowledge of the indestructibility of matter.

---

[*] "Si le rétablissement des sciences et des arts a contribué à épurer les mœurs."—"Œuvres complètes," vol. I., p. 463, 1875.

[†] *Loc. cit.* p. 469.

[‡] *Loc. cit.* p. 470.

In the nineteenth century, science has made a revolution in life by its application of steam and by its other triumphs. None the less it has not satisfied many distinguished persons. And to-day we find a writer of genius, in the manner of Rousseau, raising his voice against the science of the nineteenth century.

Tolstoi, in an essay of which the title is, "On the Aim of Science and Art," has attempted to show the incompetence of science with regard to the great problems that occupy humanity. The task set himself by the Russian writer was much harder than that of Rousseau, for with the passing of a century science has become much more powerful.

Tolstoi is convinced that theoretical investigations into the origin of life, the intimate structure of living matter and so forth, are of no importance to human beings, and serve no other purpose than to flatter the pretensions of the learned. "All that we call culture," he affirmed, "our sciences, our arts, improvements in the amenity of life, are no other than attempts to deceive the moral cravings of mankind; all that we call hygiene and medicine are no other than attempts to deceive the physical and natural cravings of mankind."*

The whole progress of science "up to the present time, has not only not improved the lot of the majority of mankind, that is to say of the labourers, but has made it worse."†

Tolstoi thinks that the epithet "true science" could be given only to "knowledge of the right aim and true happiness of each individual and of mankind as a whole. Such a science would serve as a guiding thread in determining the proper sphere of all knowledge" ; "without knowledge of the proper aim of life and of the real good of humanity, all other knowledge and every art become merely amusements idle or even harmful."*

---

* *Loc. cit.* p. 437.

† *Loc. cit.* p. 397.

The chief grievance of the great Russian writer against knowledge, culture, and progress can be resolved into the powerlessness of these to explain the most difficult problems of humanity, that is to say the real aim of human life, and what really constitutes true happiness.

In this connection, Tolstoi gives expression to a view which is shared by many thinkers. Some years later, Brunetière,† a well-known French writer and public man, under the influence of a recent journey to Rome and visit to the Pope, made public a similar opinion, and proclaimed aloud the fallibility of science.

Brunetière made his criticism as follows : "For the last two or three centuries, science has promised to change the face of the earth, to dispel every mystery ; she has not done so. She is powerless to resolve the sole problems that are essential, that concern the origin of man, the rules for his conduct, and his future destiny. We know now that natural science can teach us none of these matters. Thus, in the battle between science and religion, science has been defeated, because she has had to admit her powerlessness precisely where religion is most strong. For religion gives the solutions that science has failed to supply. Religion teaches us what we can learn neither from anatomy nor from physiology, that is to say, what we are, whither we are going, and how we ought to act. Religion and science supplement each other; and, as science can do nothing for morality, it becomes the duty of religion to take her place."

---

* *Loc. cit.* p. 411.

† *Revue des Deux-Mondes* 1895, No. 1. p. 97. "La Science et la Religion." Paris, 1885. *Le Figaro*, January 4, 1899.

It has been replied to Brunetière, that his recriminations are unfounded, first, because science has never undertaken to solve the great problems of the aim of life and the proper basis of morality; next, because it is probable that these problems will never be solved by the human understanding. Charles Richet, a well-known French physiologist, made a vain effort to find any written evidence that science had promised to solve the great problems which have absorbed the attention of Tolstoi and Brunetière as well as of quite a large section of humanity. "In what standard works has science made the astonishing promises that M. Brunetière recalls with so much bitterness?" asked Richet.* "I have now before me," he proceeded, "the Manuel du baccalauréat ès sciences (Guide to a Degree in Science). It is a summary of contemporary scientific ideas. I have looked through it in vain for promises—it contains no promises."†

The promises referred to must be looked for in scientific treatises that deal in generalisations. It is not to be disputed that, since the renaissance in Europe of the rational and sceptical spirit, that is to say, in the last two or three centuries, the view has been proclaimed that all human life may be regulated by natural laws without the interposition of dogmas, either metaphysical or religious. Attempts of this kind have been numerous. Büchner, in his treatise on "Force and Matter," in which he tried to give a general conception of the universe based on the scientific knowledge of the nineteenth century, made very plain statements on this point. "We must seek the foundation of morality," said the German populariser, "elsewhere than in the time-worn and fantastic belief in the supernatural. Science must replace religion; belief in the real existence of a natural and immutable order in things must displace belief in spirits and ghosts; natural moral law must take the place of artificial or dogmatic morality."* Büchner even tried to indicate what natural morality is. According to him it is "the law of mutual consideration of the equal rights of each person, both from the general and the individual point of view, so as to assure the greatest happiness of the greatest number. Everything that damages or destroys the common good is 'evil;' everything that favours it is 'good.'"

---

* *Revue Scientifique*, vol. I., p. 33. 1899.

† *Ibid.* p. 34.

The other question, as to whither we are going, finds an answer in the materialistic and scientific breviary of Büchner. He disputes the idea of immortality, which has been supported by nearly all the religions, and comes to the conclusion that "there is nothing appalling to a man, "imbued with the principles of philosophy, in the conception of the annihilation of the individual life." "Annihilation is perfect rest; it is freedom from all pain and escape from the sensations that torture the body and the mind—as was explained so clearly in the great religion of Buddha; it is not to be feared, but rather to be coveted when life has reached its normal term and when old age has come with its inevitable assemblage of infirmities."

I do not wish to suggest that the views I have just quoted are peculiar to Büchner. That writer has served to a large extent as the mouthpiece of ideas current among the materialistic and positivist men of science of his time. In Haeckel's book, "The Riddle of the Universe," which appeared nearly half a century after the first edition of "Force and Matter," the same ideas are to be found. He also has found answers to the questions that absorb mankind. In his opinion also, as I have shown in chap. v. the problem of natural morality resolves itself into the social instincts of man, and has nothing to do with religious dogma. As for the destiny of man, he concludes as follows: "The best end we can desire after a courageous life, spent in doing good according to our light, is the eternal peace of the grave."*

---

* *Loc. cit.* p. 511.

There is a very close resemblance between the views of the two great popularisers of the nineteenth century. Just as Büchner, to show the stupidity of the idea of eternal life, repeated the legend of the "Wandering Jew," so Haeckel, with the same object, related the legend of the unhappy "Ahasuerus" who sought death vainly, finding his eternal life intolerable. "However gloriously we may depict this eternal life in paradise, in the end it would be a fearful burden to the best of men."

While there is no doubt but that such ideas are shared by many men who rely on scientific arguments, there are others to whom the problem presents itself differently. The German physiologist, Du Bois Reymond, after reflecting on the general problems of knowledge and the universe, proclaimed an "Ignorabimus" as a warning that a whole series of problems of the highest importance to humanity were outside the range of human knowledge and incapable of solution. These problems were precisely the seven "riddles of the universe" that Haeckel claimed to have solved in his book.

Many learned men think that the great problems, those, according to Tolstoi, that constitute the only true science, can never be solved. "Every day there comes a new conquest," said Richet,* "but we are no nearer solution of the ultimate enigma, the destiny of human life, an enigma probably never to be solved." Philosophers have taken the same view. "It cannot be from science," said Guyau, "that personality is to require the proofs of its own durability."†

---

* *Loc. cit.* p. 212.

The answers given by science as it exists to-day, have failed to console the spirits that have applied to her. When Richet, in the discussion on the "bankruptcy of science" recalled the discovery of treatment of diphtheria by specific serums as an instance of the value of scientific research, Brunetière replied, "Serum therapy cannot prevent us from dying, nor tell us why we must die." The problem of death always recurs. What is the use of saving the life of a child smitten by diphtheria only that it may grow up, and by learning the inevitability of death become filled with terror?

If science be really powerless before the gravest problems that torture mankind, if she has to excuse herself by admitting her incompetence, if she can do no better than to extol the silent annihilation of the grave, it is not surprising that many minds and these not the least capable, turn from her. The desire to find some consolation in the miseries of a purposeless existence throws them into the arms of religion or metaphysics. Here lies the explanation of the actual return in these days to faith. People plunge into mysticism hoping to find there something more comforting than the annihilation offered by science.

In all ranks of modern society there are signs of this craving for the supernatural. It is therefore extremely interesting to follow the intimate steps of such an abandonment of science and return to faith. The "Confessions" of Tolstoi gave one of the best examples of the metamorphosis.

---

* *Loc. cit.* p. 35.

† "Irreligion," p. 460.

Having reached the conclusion that life is meaningless because it cannot be harmonised with the fear of death and the prospect of absolute annihilation, Tolstoi (see chap. vi.) asked if it were not possible to solve the great problem of human existence by means of the facts of science. "I searched in all the sciences," he said, "and not only found nothing myself, but became convinced that all who sought would find nothing. Not only would they find nothing, but they would see clearly precisely what had driven me to despair, the fact that the absurdity of life is the sole indisputable bit of knowledge open to man." "For a long time, observing the grave and solemn tones of the exact sciences, which indeed, hardly touched the problem of life, it seemed to me that they must be concealing something that I did not understand."

All the while, the question that Tolstoi put to himself seemed simple enough: "Why am I to keep alive? Why am I to do anything?" or, in another way: "Has life any object that is not destroyed by the inevitable death that awaits me? To the one question, put in many ways, I sought an answer in human knowledge." "From my earliest youth the speculative sciences interested me deeply. Later on, the mathematical and physical sciences attracted me, and until my question rose up clearly before me, day by day growing larger, and imperatively demanding an answer, until then I was satisfied with the semblance of an answer given by science." "I said to myself; everything is evolving, differentiating, moving towards complexity and amelioration, and the progress is under the guidance of law. You, you yourself are part of this whole."

"Although I am deeply ashamed to confess it, there was a time when I thought myself content with these things. My muscles grew and became stronger. My memory added to its stores. My ability for thinking and understanding increased. I grew and developed, and feeling the growth within me, it seemed natural to believe that the solution of my own life was given by the law of the whole universe. But the time came when I stopped growing. I felt that I was no longer developing and even that I was slipping back. My muscles weakened; my teeth dropped out; and I felt that this law not only explained nothing, not only had never explained anything, but had not been a law at all; that in fact I had taken for a law what I found in myself at a particular stage of my life."

"As I found no explanation in science," Tolstoi went on, in his poignant narrative, "I began to look for the answer in life, hoping to find it in the men around me." "My intellect was at work, but also something else, something that I can call only the consciousness of life, like some strong force that compelled my intellect to turn in another direction and to rescue me from my desperate condition."

The new direction was the feeling of faith. "However I might put to myself the question: how must I live? the answer was—by the law of God. Whither tends my present life? To eternal pain or to blessedness everlasting. How is my life not destroyed by death? By eternal union with God, by heaven. And thus I was led inevitably to see that quite independently of human knowledge, which formerly seemed to me the only guide, mankind had another guide, a guide that is irrational; faith which makes life possible. Faith seemed to be as irrational as ever, but I could not but recognise that faith alone gave mankind an answer to the problem of life, and in consequence made life possible.

Reason had led me to the conviction that life was absurd, and so, there being no longer a reason to live, I had wished to kill myself. Looking at mankind as a whole, I saw that men kept alive by assuring themselves that they saw a meaning in life. I myself came back to that point of view. I had reached a time when there seemed to me to be no meaning in life. But as to other men, so to me, life and the possibility of living were offered by faith."

Driven in the direction of faith, Tolstoi reached the following conclusion: "The object of a man's life is the salvation of his soul; for that, we must live in God, and to live in God it is necessary to give up the pleasures of life, to work, to submit, to suffer and to be charitable." And this conclusion led to the other that "a faith has value in so far as it gives a meaning to life which is not destroyed by death."

It is plain then that all this evolution, the beginning of which was the fear of death, ended in belief in something beyond death. And it is also plain why Tolstoi should have been as bitter against science as I have shown him to be. Tolstoi does not afford the only example of a case where the failure of science to solve the problem of death has led to the abandonment of science in favour of religion. Brunetière, if it is possible to judge from his published writings, traversed similar paths in his journey to the Catholic religion.

However, even an intellect so positive and so sceptical as that of Zola has been unable to resist the lures of faith. There is a very interesting note on this subject in the *Journal* of de Goncourt, dated February 20, 1883. "To-night, after dinner, at the foot of the bedstead of carved wood, where coffee was served, Zola began to talk of death, on which his thoughts have been fixed more than ever since the death of his mother. After a short silence, he said that death had made an in-road on the nihilism of his religious convictions, as he could not face the possibility of an eternal separation."

In strata of society less impregnated with rational and scientific thought, it is plain that the return to religion must be more common. I recall the case of a woman of the people, a work-woman, who declared that she formerly had had no belief, but that, since the birth of her son, she had begun to believe in the good God, as she was convinced that it was only by such a belief that she could guard the life of her child from the evils of the world.

As things are, it is not wonderful that many people decline to educate their children in an exclusively scientific spirit, which is destructive to faith, as they cannot substitute for faith something equally consoling. Perhaps ideas of this kind lie behind the story of the apple of the Garden of Eden and the invention of the words of Jahveh : " But of the tree of the knowledge of good and evil, thou shalt not eat of it : for in the day that thou eatest thereof thou shalt surely die " (Genesis ii. 17). The legend of Prometheus, who stole fire from heaven, and was chained to a rock, is in the same category.

Solomon gave voice to the same idea, in the clearest way, in his words : " I communed with mine own heart, saying, Lo, I am come to great estate, and have gotten more wisdom than all they that have been before me in Jerusalem; yea, my heart had great experience of wisdom and knowledge.

"And I gave my heart to know wisdom, and to know madness and folly : I perceived that this also is vexation of spirit.

" For in much wisdom is much grief : and he that increaseth knowledge, increaseth sorrow" (Ecclesiastes, i. 16).

Much later, Shakespeare offered to us in *Hamlet*, the type of a man very highly cultivated, in whom reason and reflection had arrested action. As he could not solve by reason the problems that haunted him, he asked if it were worth while to remain alive. Then followed the famous lines:

> "Thus conscience does make cowards of us all,
> And thus the native hue of resolution
> Is sicklied o'er with the pale cast of thought."[1]

As so many men of genius have taken the same point of view, it becomes necessary to inquire carefully as to whether or no too much knowledge be harmful to human happiness. If science do no more than to destroy faith and to teach us that the whole living world is moving towards a knowledge of inevitable old age and death, it becomes necessary to ask if the perilous march of science should not be stayed. Is it that the attraction of mankind to knowledge is as dangerous to the race, as the attraction of moths to the light is fatal to these wretched insects? The question demands an exact answer. But before giving the verdict, the facts of the case must be examined. I shall proceed to this in the chapters to follow.

CHAPTER X

INTRODUCTION TO THE SCIENTIFIC STUDY OF OLD AGE

General account of old age—Theory of senile degeneration amongst unicellular organisms — Conjugation amongst infusoria—Old age in birds and anthropoid apes—General characters of senile degeneration—Sclerosis of the organs—Phagocyte theory of senile degeneration—Destruction of higher elements by macrophags—Mechanism of whitening of the hair—Serums acting on cells (cytotoxins)—Sclerosis of the arteries and its causation—Harm done by the microbes of the alimentary canal—Intestinal putrefaction and the modes of preventing it—Attempts to prolong human life—Longevity in biblical times

WHILE I cannot share the views of those who turn from science to seek truth and consolation in religion, it would be wrong to ignore or to be indifferent to the existence of that attitude. There are men who are tormented by the contradiction between the desire of life and the inevitability of death, and when these demand some solution of the problem, it is unreasonable merely to say that they are too exacting and should learn contentment.

If a man complains to his physician of uncontrollable hunger and thirst, he is not told that it is wrong to be so greedy, and that that fault could be mastered by strength of mind. The doctor carefully examines the patient and does what he can for the distressing symptoms, which, indeed, in this case are generally due to diabetes. Those who hunger and thirst after eternal life, ought to be similarly treated by men of science whose duty it is to ameliorate their sufferings as much as possible.

Science has undoubtedly gone far in the successful treatment of disease, both as regards prevention and cure, but it is powerless before those other evils from which Buddha implored his father to grant him exemption—old age and death. Science has attained to heights of knowledge undreamed of by Buddha's father, King Couddhôdana, and yet it knows no more than he did with regard to the problem of old age and death. Like the king, science can but reply to its questioners: "You ask the impossible. I cannot help you!"

Not only is no remedy for old age known to science, but little or nothing is known with regard to that period in the lives of men and animals. It was no easy task to compress an account of the present position of medicine within a few pages, the subject matter being overwhelming in quantity. With regard to old age it is quite the contrary, our knowledge being so limited that the subject may be dealt with in a few lines. With the advance of years, man and the higher animals undergo important modifications. They become weaker, the body shrinks, the hair whitens, and the teeth deacy, in fact, all the phenomena connected with senile decay manifest themselves.

At this period of life which overtakes various species of animals at different ages, the body becomes an easy prey to pernicious influences and diseases. The direct cause of death cannot always be determined, and is attributed to the general breaking up of the system which we call natural death. The first question which presents itself to the scientific mind is whether this degeneration or senile decay is proper only to man and the higher animals, or is common to all forms of life. We have all seen very old trees, the appearance of which proclaims their age. The trunk is decayed, the bark gnarled, the branches shrivelled, and the leaves scanty. Some kinds of trees live for hundreds—possibly thousands—of years, while others age with comparative rapidity. Senile decay is not unknown in the vegetable kingdom, and its presence is suspected even among creatures of very simple organisation belonging to the group of infusoria. These creatures may be reared with ease in vessels containing macerations of chopped hay or leaves. They multiply by means of division (Fig. 12), an operation which takes place at very short intervals, some of them dividing nearly every hour. Owing to this rapid multiplication the vessels soon become full of a mass of infusoria. M. Maupas,* a very distinguished zoologist, observed that the infusoria became smaller and smaller after a number of generations, exhausting themselves, as it were, and perishing unless two individuals succeed in uniting. This process of "conjugation" (Fig. 13), involves an exchange of portions of the bodies of the two creatures and brings about a complete rejuvenescence of the two individuals. After conjugation, a process essentially similar to the details of sexual fertilisation, the infusoria resume the normal appearance and again become capable of reproduction by simple division for many generations.

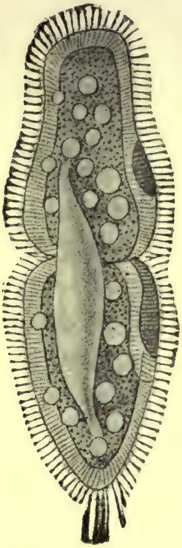
FIG. 12. Paramecium about to divide in two.

The periodical debility, which precedes conjugation is, according to Maupas, an instance of senile degeneration among infusoria. He has recognised its existence in the case of many species of the higher infusoria (*Ciliata*), but while this phenomenon has been observed in the case of many other simple organisms, it cannot be set down as universal among microscopic beings. Among bacteria, a group that includes the greater number of pathogenic organisms, conjugation has been very rarely observed. Even the largest kinds, such as, for instance, the *anthrax* bacillus, may be propagated for a long series of generations without the occurrence of conjugation.

---

* "Le Rajeunissement Kariogamique chez les Cillés," "Archives de Zoologie Expérimentale," 1899.

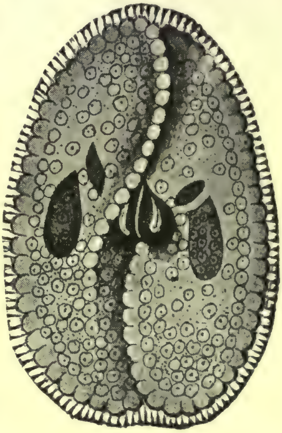

FIG. 13. Conjugation of two Paramecia (after Bütschli).

Even in the case of the infusoria which by means of the process of conjugation can reproduce indefinitely, the preconjugal debility cannot be identified with the senile degeneration of human beings, the higher animals and trees. In all these debility is the antecedent, not of conjugation and rejuvenescence, but of the end of life.

Another important difference is that in the case of infusoria the preconjugal debility does not occur in every individual, as is the case with the animals and plants which display real old age. In the infusoria an indefinite number of generations occur between the individuals that display debility and those that are ready for conjugation.

If, in spite of these differences, we were to insist on the existence of an essential resemblance between senile degeneration in man and preconjugal debility in infusoria, it would be enough to reflect on the result of applying to the case of man what is an infallible remedy in the case of the infusoria. For conjugation brings about a real rejuvenescence of the infusoria and a similar event in the case of man would only increase the debility. Moreover, according to recent investigations of Calkins,* infusoria, weakened by degeneration, may become young again not only by conjugating with their kind, but by the addition of bouillon or extract of brain to the medium in which they live.

Real old age is a phase of existence in which the natural forces abate never to be renewed. In animals, the life cycle of which is very definite, the signs of senile degeneration are not visible. Insects, in the adult condition, very often live only a short time, and die without displaying the slightest mark of age. In the case of lower vertebrates, old age is little known, and has few signs. On the other hand, mammals and birds display senile atrophy in a marked fashion.

Some species of birds live to a great age, longevity being more common than among mammals. Cases in which birds such as geese, swans, ravens, and some birds of prey, have been known to reach the age of fifty years,† are not uncommon, whereas such an event is very rare in the case of a mammal. Even small birds, such as canaries, may live as long as twenty years. Parrots are especially long-lived birds. Cockatoos have been known to reach the age of eighty years and more. I myself have had opportunities of observing a South American parakeet (*Chrysotis amazonica*) which lived more than eighty-two years, longer than is usual even with parrakeets. Several years before it died the bird showed unmistakable signs of old age. It became less lively, its plumage, although it did not whiten, lost much of its brightness, and the joints of the claws showed evidence of the presence of disease. In short, the parrakeet was obviously worn out and debilitated.

---

* *Biological Bulletin*, vol. III., October 1902, p. 192; "Archiv. für Entwickelungsmechanik," vol. XV. p. 139.

† Gurney, "On the Comparative Ages to which Birds Live," *The Ibis*, January 1899, p. 19.

Mammals show the signs of age even more plainly than do birds. A dog reveals old age by its slow movements, its white hairs, and worn teeth. The appearance of such an animal is never agreeable, while it is often dirty and ill-tempered. Brehm describes the old age of a dog as follows: "At twelve years of age a dog has grown old, and his gait and whole organisation show signs of age. The coat is no longer glossy; the forehead and muzzle are grey, the teeth are blunted or have fallen out. The animal is lazy and apathetic. Many such dogs are dumb and blind. Dogs may live for twenty, six and twenty, or even thirty years, but such cases are most unusual."

As the dog is a domesticated animal, it might be argued that its old age, with its manifest signs of decrepitude, is the result of the artificial conditions of its life. To decide on this point it is necessary to examine an instance of old age in a wild animal. This presents certain difficulties since wild animals when old and feeble become an easy prey to carnivorous enemies. It will best serve our present purpose to consider such information as has been collected regarding the period of old age in anthropoid apes.

The natives of Borneo have observed "old orangs, which have not only lost their teeth, but being too feeble to climb, live on the fallen fruits and herbs." * Gorillas, according to Savage, turn grey in their old age, from which has arisen the erroneous view that there are two species of the gorilla.

* Huxley, "Man's Place in Nature."

In their wild state, monkeys, like ourselves, are subject in their old age to various distressing ailments. Senile degeneration, then, which is universally looked upon as one of the greatest evils of life, is by no means restricted to the human race. Old age, as portrayed in the Buddhist legend, referred to in chap. vi., is perhaps somewhat exaggerated, but this period of life is undoubtedly characterised by changes of such a nature as considerably to affect the happiness of the old. Buddha, being a pessimist, took too dark a view of this, but let us hear what optimists have to say on the subject. Max Nordau, a doctor, a writer of books and a journalist, says: "Physically speaking, an old man presents an unpleasant picture of decrepitude to the casual observer. Morally speaking, he is a blind and pitiless egotist, having lost all interest in anything outside himself. Intellectually he becomes feeble-minded and narrow in his views, being governed by antiquated notions and prejudices, and incapable of grasping new ideas." *

It may be objected that I am here supporting my argument by quoting from a writer who, in his capacity of clever journalist, rather forces the note. Let me therefore refer to what a learned physiologist said when addressing a serious audience assembled for the purpose of obtaining truth and information from his lips. After dealing in broad outline with the physical degeneracy caused by old age, Longet † draws the following mental picture: "The old feel that their task in life is accomplished, and believe themselves to be universally grudged the space they occupy in the world. This renders them suspicious of all around them, and jealous of the young. Their craving for solitude

---

* "Psychological Paradoxes."

† "Traité de Physiologie," Second Edition, vol. II. p. 935.

and the uncertainty of their tempers are due to the same cause. All old people are not like this, of course. The hearts of some remain youthful and beat strongly within their feeble frames, but, as a general rule, they are morose and a nuisance to themselves and others, excepting when they are surrounded by their children or grandchildren, who like to listen to them about the past, and who make excuses for the present. Thus the years speed onward, every round of the clock bringing the end nearer, and every hour adding a new wrinkle to their faces, some fresh weakness and some new regret. Their bodies . . . become decrepit ; their backbones, too weak to hold them upright, curve over and bend them downwards towards the earth."

There can be no doubt but that the period of old age is sad, and a thorough knowledge of it is necessary before it can be understood. Disease can only be successfully dealt with when the cause of its presence is known, and so it is with old age.

Is it possible, one might ask, at the present stage of the world's knowledge, to define, with even approximate accuracy, the characteristic features of senile decay ? The task is difficult, for although the subject is very important, few facts have been collected.

It is common knowledge that the flesh of old animals, used as food, is tough. An old fowl cannot be compared with a tender and juicy chicken. Organs such as the liver and kidneys are much harder in the case of old animals. The horny flesh of old animals is often compared with boot-leather. Although the comparison does not pretend to be scientific, it is far from being incorrect. Boot-leather is made from the hides of animals ; that is to say, of a very resistant material that is called "connective tissue," and which consists of a dense mass of fibres, mingled with the living elements or "connective tissue" cells. This tissue is very durable and so is employed for boots and shoes.

The infiltration of any organ with connective tissue makes it tough and unpalatable. This hardening is called a *sclerosis* (of the liver, kidneys, &c.). In old age many organs exhibit this tendency to hardening or sclerotic degeneration. The fact has been known for long, but its significance has been perceived more recently. Demange,* in his monograph on the organic changes associated with old age, states as follows: "Besides atrophy and degeneration of the parenchymatous elements,† there is to be observed a profound change in the framework of connective tissue, which serves to support the organs. In some cases the skeletal framework of an organ becomes more conspicuous, simply on account of the degeneration of the cells; this is the condition usually present in the liver of aged persons. More often, however, the connective tissue receives some kind of stimulation, which, although it does not amount to inflammation, brings about an active growth and resulting sclerosis. According to the particular case, the hardening occurs in the form of isolated patches or strands, or affects the whole periphery or even the depths of the organ, and smothers the higher elements in its meshes, so producing a further degeneration. The cellular elements disappear gradually, connective tissue taking their place, and the change may be so profound, that as in the case of the prostate gland, the altered organ may actully transcend the normal size, partial or general atrophy, however, being more often the result."

---

* "Etude Clinique et anatomo-pathologique sur la Vieillesse." Paris, 1886.

† The parenchymatous elements are the most important cells of the organs, *i.e.*, of the liver, muscles, brain, &c.

Sclerosis in old people sometimes takes the form of a hardening of the liver (cirrhosis of the liver) or of the kidneys (renal cirrhosis), but it is the arteries which are most commonly affected by it, producing a symptom of degeneration which is called arterial sclerosis.

Cazalis long ago originated the oft-repeated aphorism: "A man is as old as his arteries," these vessels, by means of which the blood is distributed throughout the whole system, being of immense importance in the economy of the organism. When the connective tissue is so freely developed as to cause a hardening of the arteries, these are hampered in the exercise of their function and become very brittle. According to Demange, all the special modifications undergone by the body during the period of old age may be attributed to this atrophy of the arteries, but this theory is proved to be an exaggeration by the fact that post mortems on the aged frequently reveal the presence of little or no arterial sclerosis.

It might fairly be supposed that the hardening seen in many organs of the body during the period of old age is universal, and lends greater strength to the frame. The bones, which are separated from one another in youth, become welded together in old age owing to the calcareous deposits in the joints, and the ossification of the joints between the vertebra frequently causes the backbone to assume the appearance of a continuous bone, the greater part of the cartilage having become ossified. In spite of this, and as though for the purpose of proving how physically full of contradictions is the period of old age, the human frame actually becomes lighter and the quantity of component mineral substances becomes less. This brings about a liability to fracture of the bones in old people. The fracture of the neck of the femur is a constant cause of death in the aged, as occurred for instance in the case of Virchow, one of the most distinguished medical scientists of the nineteenth century.

Is science, it may be asked, in a position to state precisely what are the principal modifications which occur in the tissues of old people? At the International Congress of Medicine held at Berlin in 1890, a well-known German anatomist, Merkel,* attempted to reply to this question. Speaking of the tissues of old people, he tried to show that certain of these, such as the skin and the mucous membrane (the epithelial tissues), preserve their youthful characters to the end, whereas others, such as the connective tissues, display profound changes. This essay was the first attempt to form a picture of the details of senile degeneration, but it did not reach any simple, general conclusion.

Later on, I myself † tried to complete the work, and for the purpose made use of the published results of all the investigators who had studied senile degeneration. I gave a summary of my conclusions in the following words: "In senile atrophy the same condition is always present: *the atrophy of the higher and specific cells of a tissue and their replacement by hypertrophied connective tissue*." In the brain, the nerve-cells disappear; that is to say, the cells which subserve the higher functions such as intellectuality, sensation, control of movement, and these are replaced by elements of a lower kind, in especial by neuroglœa, a kind of connective tissue of the brain. In the liver, the hepatic cells, of great importance to the nutrition of the organism, yield to connective tissue. In the kidneys, that tissue invades and blocks the tubes by which the necessary process of eliminating soluble waste matter is accomplished. In the ovaries, the ova, the specific elements which serve to propagate the race, are similarly eliminated and replaced by granular cells, a variety of connective tissue. In other words, a conflict takes place in old age between the higher elements and the simpler or primitive elements of the organism, and the conflict ends in the victory of the latter. This victory is signalised by a weakening of the intellect, by digestive troubles, and by lack of sufficient oxygen in the blood. The word conflict is not used metaphorically in this case. It is a veritable battle that rages in the innermost recesses of our beings. Distributed throughout every part of our bodies are certain cells which fulfil special functions of their own. They are capable of independent movement, and also of devouring all sorts of solid matter, a capacity which has gained them their name of phagocytes or voracious cells. The function these phagocytes fulfil is a very important one, for it is they that congregate in vast numbers around microbes or other harmful intruders, in order to devour them. Effusions of blood and other elements, on penetrating to parts of the body where their presence is disadvantageous, are absorbed by these phagocytes. In cases of apoplexy, where blood is shed into a part of the brain, setting up paralysis, the phagocytes cluster round the clot and devour the blood corpuscles it has encased. This absorption is a lengthy process, but by degrees, as the pressure of the effusion of blood is removed from the brain, and paralysis disappears, the health of the organism may become completely restored, recovery in such a case being due to the work of the phagocytes. After childbirth, when the uterus presents the appearance of a great open wound clotted with blood, it is again the phagocytes that clean it and re-establish the normal condition. It is plain, therefore, that the part played by these cells is beneficent.

---

* "Bemerkungen üb d. Gewebe beim Altern," "Verhandl. d. X. Internat, Medic. Congresses." Vol. II., p. 124. Berlin, 1891.

† "Année Biologique" de Yves Delage, vol. III., p. 249. 1899.

The phagocytes may be divided into small active phagocytes, generally known as the microphags, and larger phagocytes called macrophags, which are sometimes active and sometimes still. The former, which are produced in the marrow of the bones, circulate freely in the blood, and occur as some of the white blood corpuscles, or leucocytes. They are distinguishable by their oval shape which facilitates their easy passage through the smaller blood-vessels, and allows of their accumulating in great numbers in the exudations that form around microbes. These exudations may be formed extremely rapidly, and so may arrest infection in the case of many diseases.

The absorption of extravasations of blood and the healing of wounds are the work of the macrophags. In a general way, the microphags may be said to rid us of microbes, and the macrophags to heal mechanical injuries, such as hæmorrhages, wounds, and so forth. Macrophags possess a single unlobulated nucleus, and occur as white corpuscles in the blood, lymph, and exudations, or as the fixed cells in connective tissues, the spleen, and the lymphatic glands, &c.

The phagocytes are endowed with a sensitiveness of their own, and by means of a sense of smell or taste are able to recognise the nature of their surroundings. According to the impression made upon this sense, they approach the object which arouses it, exhibit indifference to it, or withdraw from its vicinity. When, however, an infectious microbe finds its way into the body, the microphags are attracted by its excretions and swarm into the exudations surrounding it. The macrophags play a very important part in bringing about senile decay. The atrophy of the kidneys in old persons is attributable to their agency (Fig. 14). They accumulate in large quantities in these organs, clustering round about the renal tubes which they ultimately cause to disappear. Having appropriated the place of the renal tubes, the macrophags proceed to form connective tissue, which thus takes the place of the normal renal tissue. A similar process occurs in the other organs that degenerate in old age. In the brains of old persons and animals, for instance, it is known that a number of nervous cells are surrounded and devoured by macrophags (Fig. 15). Judging from the investigations mentioned above, I think I am justified in asserting that senile decay is mainly due to the destruction of the higher elements of the organism by macrophags. This conclusion has been confirmed by means of direct observation, which was the more necessary as it is contrary to the opinions of some biologists. Marinesco,* an authority upon everything connected with the nervous system, has disputed my theory, asserting that

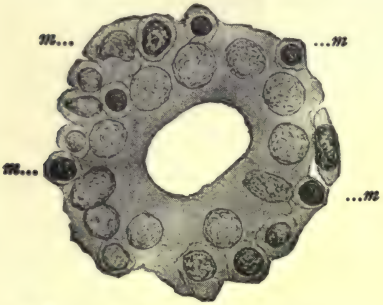

Fig. 14. Section of a Renal Tubule, invaded by Macrophags, from the body of an old man of 90 years. *m*=macrophag. (From a preparation made by Dr. Weinberg.)

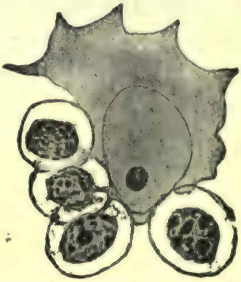

Fig. 15. Cell from the brain of a woman 100 years old being devoured by macrophags. (From a preparation made by Dr. Philippe.)

---

* *Comptes Rendus de l'Académie des Sciences*, April 23, 1900.

the destruction of the specific elements in the nervous centres of old persons is not brought about through the agency of macrophags. In support of his theory, M. Marinesco was good enough to send me a series of preparations from the spinal marrow of persons of very advanced years from which evidence of destruction by means of phagocytes or phagocytosis, was completely absent. I freely admit the absence of phagocytosis in M. Marinesco's preparations, but these were derived from the cells of spinal marrow, which is much less subject to the ravages of senile decay than is the brain. Even in the lower portions of the encephalon, senility and its parallel, phagocytosis, are uncommon, whereas in the brains of old persons, which are more generally affected by senile decay, the higher elements are clearly shown to undergo destruction by macrophags (Fig. 15). The same phenomenon may be observed in the case of parrots and dogs of advanced age, and in other animals.

So universal a symptom of old age is the invasion of the tissues by macrophags, that it must be regarded as of immense importance. In order, however, to determine more precisely the nature of the function fulfilled by these phagocytes, it was necessary to select a specially favourable subject of investigation. My choice fell upon an examination into the causes of the hair turning white,* that being as a rule the first visible sign of approaching old age.

Hair, before it has lost its colour, is full of pigment scattered throughout the two layers of which each hair is composed. At a given moment, the cells of the central cylinder of a hair become active, and proceed to devour all the pigment within their reach. Once they are filled with coloured particles, these cells, which are a variety of macrophag (generally called pigmentophags or more properly speaking chromophags), become migratory, and, quitting the hair, either find their way under the skin or leave the body (Fig. 16). Th colouring-matter of the hair is removed in this way by chromophags, leaving the hair colourless.

---

* "Annales de l'Institut Pasteur," p. 865. 1901.

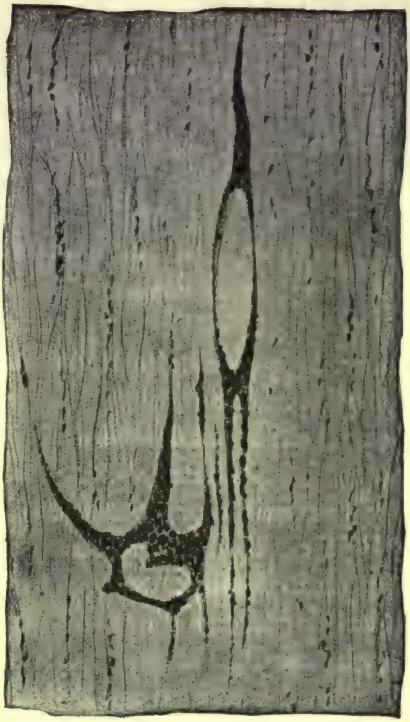

FIG. 16. Hair about to become grey. Chromophags transporting the pigment granules.

The process by which hair becomes white is of importance, because it shows that the activity of macrophags is a dominant factor in bringing about senile decay. The brittleness of old people's bones is probably due to a similar cause, *i.e.*, to the absorption and destruction of the framework brought about by macrophags invading the layers of bone. There is still much that remains unknown in this subject, which is well worthy of special research.

The activity acquired by macrophags during old age is closely connected with the phenomena that are characteristic of certain chronic complaints. Sclerosis in old persons belongs to the same category as organic sclerosis, which may be set up by various morbid influences. The analogy between senile decay of the kidneys and chronic nephritis, commonly called interstitial nephritis, is incontestable. The destruction of nervous cells through the agency of macrophags, which we have already mentioned as occurring in old age, is equally a symptom of several diseases of the nervous centres, such as general paralysis of the insane. Arterial sclerosis in old persons is actually an inflammatory disease, similar to the inflammation of the arteries set up by other maladies.

The similarity between senility and disease has long been recognised, and partly accounts for the repugnance we all experience at the approach of old age. In childhood and early youth people regard themselves as older than they really are, and long to be "grown-up," but having once arrived at man's estate, they do not wish to grow old. An instinctive feeling tells us that there is something abnormal in old age. It cannot be regarded as a part of healthy physiological function. No doubt, because old age is the inevitable lot of mankind, it may be termed normal, in the same fashion as we call the pains of childbirth normal, since few women escape them. In both cases, however, we have to deal with pathological rather than physiological conditions. Just as every effort is made to relieve the sufferings of a woman in labour, so it is natural to try to suppress the evils accompanying old age, but whereas in childbirth an anæsthetic affords relief, old age is a chronic malady, a remedy for which is much harder to find. We have seen that in old age a struggle takes place between the higher elements and the phagocytes, the end being usually a weakening in vitality of the former, while the activity of the latter is enormously increased. It would appear, arguing from this, that one means of fighting against old age, pathologically speaking, would be to strengthen the higher elements of the organism, and to weaken the aggressive capacities of the phagocytes. Let me at once warn the reader that this is not presented as a definite, but as a possible solution of the problem, and is offered for consideration like many other hypotheses on scientific questions. The properties of cellular elements are easily changed when subjected to various influences, and it is therefore not irrational to seek some means of strengthening the blood corpuscles, nerve cells, liver cells, muscular fibres of the heart, and so forth. The task has become easier since the discovery of serums that have specific actions on the tissues.

In the third chapter I stated that serums were known which give precipitates only with the blood of man and of his near relatives the anthropoid apes. serum of this kind has a definite specific action. Serums may be prepared that dissolve only the red corpuscles of particular species of animals, and that are without action on the other organic elements. It has been found possible, even, to prepare a serum that arrests instantaneously the movements of human spermatozoa, and that is neutral to the similar cells of other animals.

These serums are all prepared in the same way. The cellular elements in question, spermatozoa or red corpuscles, cells of the liver or of the kidney, taken from one animal, are injected into an animal of another species. After several injections have been made, the serum of the animal operated on becomes active with respect to the cells introduced into its body. These serums were discovered by J. Bordet of the Pasteur Institute, but the results have been confirmed by investigators in other countries. The serums are specifically *cytotoxic*, that is to say, they poison particular kinds of cells.

Now it has been shown that such serums, employed in small doses, do not kill or dissolve the specific tissue elements, but actually strengthen them.* Here the case is analogous with the action of poisons, such as digitalis, which kill in strong doses, but which in weak doses improve or strengthen the action of certain tissues. In accordance with this indication, experiment has shown that small doses of a serum which is capable of dissolving the red corpuscles of human blood, actually increase the number of those in the body of a patient treated by injections. In the same way, in the case of a serum large doses of which destroy the red corpuscles of a rabbit, small doses increase the number of these elements in the blood.

---

* *See* the "Annales de l'Institut Pasteur," vol. XIV., pp. 369,

Here there seems to be a rational method by which we may strive to strengthen the higher elements of the human body, and so prevent them from growing old. The task, at first sight indeed, seems an easy one, only necessitating the injection of a horse (or other animal) with finely minced atoms of human organs, such as brain, heart, liver, kidney, &c., when serums could be drawn off in the course of a few weeks, capable of acting upon those organs. In reality the process would be a very difficult one to carry out, as human organs are rarely obtainable in a condition suitable for injecting into animals. Post mortems can only be legally made twenty-four hours after death, and there are many other obstacles in the way of removing organs from dead bodies. Even if all these difficulties were overcome, another difficulty that would present itself would be the experimenting with various doses of cytotoxic serums of various strength. It is not therefore to be wondered at that the

378, 390, 402. 1900. The results described therein have been confirmed by Bélonovsky ("Sur l'Influence de l'Injection de Diverses Doses de Sérum Hémolytique sur le nombre des Eléments du Sang." Saint Petérsbourg, 1902), who has found that there is an increase in the amount of hæmoglobin and of red-blood corpuscles in the blood of anæmic patients that have been treated with minute doses of hæmolitic serum.

attempt to reinforce the higher elements of the human organism will require much time. If it be necessary to strengthen the higher elements (nervous, hepatic, renal, and cardiac cells), it is plain that they undergo a progressively weakening process. It would be of the highest importance to ascertain the cause of this, for the knowledge would be a guide to future action.

The similarity between senile decay and the diseases entailing atrophy in the more important human organs suggests a similitude in cause. Scleroses of the brain, kidneys, and liver frequently originate in intoxication by poisons such as alcohol, lead, mercury, and so forth, or the disease may be induced by some virus the virus of syphilis being a common cause.

The immense importance of venereal disease as a malevolent factor in the phenomena of old age, is especially manifested in arterial sclerosis. According to the careful investigations of a Swedish doctor, Edgren,* published in his "Monograph on Arterial Sclerosis," one case in every five of this disease is caused by syphilis, and he shows that chronic alcoholism is an even more frequent cause (25 per cent.). These two factors when united are responsible for nearly half (45 per cent.) the cases of arterial sclerosis that occur. Syphilitic virus and alcohol act as poisons which bring about first degeneration and brittleness of the arterial walls, and eventually a weakening of the higher elements of the organism. The phagocytes, being cells of an inferior order, are less sensitive to these poisons, which accounts for their victory over the poisoned elements.

Rheumatism, gout, and infectious diseases only play a secondary part in setting up arterial sclerosis. Edgren asserts, as the result of very careful calculation, that in nearly every fifth case he found it was impossible to account for the origin of arterial sclerosis. In the majority of cases the sufferers were elderly persons who, according to Edgren, "were afflicted with physiological sclerosis." *

---

* "Die Arteriosclerosis." Leipzig, 1898.

I take it that this sclerosis of unknown origin was by no means physiological but was pathological like that set up by syphilis or alcoholism. The question then arises whence comes the poison in such cases? In syphilis there is a virus of a definite nature to deal with, which causes infection or poisoning, and brings about arterial sclerosis, general paralysis, and other serious ailments. Alcoholism is a poison arising from fermentation, excited by microscopical fungi related to true microbes. Instances of arterial sclerosis which are due neither to syphilis nor to alcohol poisoning nor to any other known cause, can only be accounted for as probably arising from poisoning set up by the mass of microbes congregated in the human intestines. Among these microbes there may be some that are harmless, and possibly even beneficial, but there are undoubtedly a great number the presence of which is extremely prejudicial to health and life. It is impossible to enter into the details of such an important question, and a brief mention must suffice.

The human intestine contains an enormous quantity of bacteria, which, according to the recent investigations of Strassburger,† increase at the rate of 128,000,000,000,000 each day. These microbes, of which there are few in the digestive portion of the alimentary canal, are very numerous in the large intestines. *i.e.*, in the lower part containing the waste material. The remains of undigested foods and the mucous secretions form a medium very favourable to the growth of microbes. This bacterial flora constitutes a third part of the human excreta. It is very varied, and contains an immense number of different species, among which are bacilli, cocci, and many kinds of other bacteria, about which little is known. The distribution of this bacterial flora shows that it contributes nothing to the well-being of man, being scanty in the digestive portions of the body, and abundant in other parts of the gut. This fact alone suffices to refute the theory of those who attribute great functional importance to the intestinal flora. This theory originated principally from the fact that certain animals perish when brought up under special conditions protecting them from the presence of microbes. Schottelius * was the first to try the experiment of rearing chickens in a cage specially constructed for this purpose. The chickens hatched out, and lived for a few weeks: then, there being no microbes within them and only sterilised food being given, instead of increasing in weight, they became thin and showed signs of starvation. Schottelius supplied them with food from which bacteria were no longer excluded, upon which the chickens rallied, and soon became completely restored to health. Madame Metchnikoff † tried a similar experiment with tadpoles, which, when kept in vessels and fed upon bread containing the usual microbes, developed normally, but which, when reared under conditions entirely free from the presence of microbes, lived on for some months, but in a degenerate condition, their development being arrested.

---

* *Loc. cit.* p. 118.

† "Zeitschrift für Klinische Medicin," vol. XLVI. p. 434. 1902.

On the other hand, Nuttall and Thierfelder ‡ succeeded in keeping alive for several days new-born guinea-pigs, the

---

* "Archiv. für Hygiene," vol. XXXIV., p. 210, 1898; *ibid.* vol. LXII., p. 48. 1902.

† "Annales de l'Institut Pasteur," p. 630. 1901.

‡ "Zeitschrift für Physiologische Chemie," p. 109. 1895.

alimentary canals of which were free from microbes, and which were fed only on absolutely sterilised milk and vegetable matter. Notwithstanding this complete absence of microbes the guinea-pigs developed well.

As the two sets of experiments were conducted under conditions arranged so carefully that the chance of error was excluded, it is important to try to reconcile the apparently contradictory results. There is one point common to these three experiments, *i.e.*, that they were all executed upon newly born creatures. Now it is well known that at birth the digestive juices are often very imperfectly secreted. In the case of the guinea-pigs, these juices sufficed in quantity for the digestion of the diet provided, whereas in the cases of the chickens and the tadpoles, the digestive juices were incapable of fulfilling their function satisfactorily, and the introduction of microbes endowed with considerable digestive capacity into the intestines compensated for the functional inefficiency of the gastric juices. In addition to the guinea-pigs experimented upon by Nuttall and Thierfelder, there may be mentioned a whole series of lower creatures such as the larvæ of mites and other insects which are able to digest such indigestible material as wax and wool in spite of the total absence of microbes within their intestinal tubes. These experiments are corroborated by the established physiological fact that the gastric and pancreatic juices of mammals easily digest the most varied kinds of foods, even if treated so antiseptically as to ensure the total exclusion of microbes from the intestines.

I need not go further into this subject as the facts which I have cited suffice for my present purpose. The complete atrophy of the large intestines in the case of the woman referred to in chap. iv. proves not only that this portion of the alimentary canal is not indispensable to healthy life, but that life may be maintained in the absence of the flora of the large intestines. And this really is the centre of the problem. The useless bacterial flora may give rise to serious or fatal maladies. Wounds of the abdomen are really serious only when they penetrate the large intestines and so allow the entrance of bacteria from that region to the peritoneal cavity. In such an event, the microbes rapidly multiply in the organism and produce a grave and frequently mortal illness. So long as the microbes remain within the intestines very few of them get into the circulation, and with these few the organism is able to cope. While most of the microbes are confined within the walls of the alimentary canal, the soluble excretions produced by them pass through into the lymph and blood. Quite a number of different facts establish this. Thus, for instance, it has been known for long that the urine of human beings and of animals contains a series of substances such as derivatives of phenol, indol, creosol, skatol, and so forth. In certain diseases the amount of these substances greatly increases. The stagnation of the contents of the intestines increases the amount of phenol and indol. Such facts and many others make it probable that these substances are the products of the bacterial flora of the intestines. They are absorbed by the intestinal wall, pass into the general circulation, and may give rise to various symptoms of a more or less serious nature.

Baumann, who has done much work on the subject, has brought together a series of arguments supporting the bacterial origin of the presence in the urine of the substances in question. Ewald, working from another point of view has obtained strong confirmation of Baumann's suggestions. He had the opportunity of making observations on a female patient, in whom, on account of a strangulated hernia, an intestinal fistula was established. Throughout the time during which the large intestines were inactive, the urine contained neither phenol nor indol. But as soon as the fistula was closed and communication with the large intestine had been re-established, phenol and indol reappeared in the excreta. Ewald formed the opinion, therefore, that these substances were products of the large intestine.

I need not weary the reader with more of the facts serving to show that the bacterial flora of the large intestines is the source of many poisons harmful to the body. It is among such substances that we must look for the slow poisons which, in the absence of syphilis or alcoholism, produce the arterial sclerosis of old age.

In the fourth chapter I gave reasons to support my view that the large intestine in mammals had been developed because, by storing the products of digestion, it allowed them to run long distances without stopping, and so was an advantage in the struggle for existence. Moreover, the microbes which abound in the contents of the gut make it possible to use certain substances such as cellulose, that are difficult to digest. But these two advantages do not count in the case of the human race. Man does not secure his prey or escape from his enemies by the rapidity of his locomotion. The great development of his intellectual powers has given him advantages of another kind. Moreover, by the use of cooking and the cultivation of plants of high nutritive value, he is able to dispense with the digestion of cellulose.

There is another side to the picture. Ignorant of death and of old age, mammals have acquired the advantages of a large intestine at the expense of longevity. I have already stated that birds live longer than mammals. Birds are practically devoid of a large intestine, and maintain a bacterial flora very much poorer than that found in mammals. There is one exception to this rule, an exception of great importance. Ostriches and their allies, the largest known birds, are characterised by absence of the power of flight and by rapidity of terrestrial locomotion by which they escape their enemies. These are the only birds in which the large intestine is well-developed. The duration of life is much less in their case than in that of smaller birds, such as parrots, ravens, and swans. According to M. Rivière, who has been engaged in ostrich farming in Algeria, these large birds do not live more than thirty-five years. The mode of life, and the shorter duration of life, the huge development of the large intestines and the rich bacterial flora found therein make the ostriches much more like mammals than birds.

It is to be noticed that many birds in which the duration of life is long do not possess a cæcum, the portion of the alimentary canal that contains most bacteria. Examination of the intestinal contents of parrots shows that there exist in these birds very few microbes. A comparative study shows plainly that the existence of an abundant intestinal flora, useless for digestion, helps to shorten life by producing bacterial poisons which weaken the higher elements and strengthen the phagocytes.

The human race has inherited from its ancestors an enormous large intestine and conditions favourable to the life of bacteria. It has to endure the disadvantages of this heritage. On the other hand, the brain of man is very highly developed, and with the increase of intellectual power has come a consciousness of old age and death. Our strong will to live is opposed to the infirmities of age and the shortness of life. Here lies the greatest disharmony of the constitution of man.

If we desired to make the phenomena of old age physiological rather than pathological, it would be necessary to reduce the evils arising from the presence of a large intestine. It is impossible, I may at once say, to wait for the operation of forces independent of the human will and that might lead to the suppression of an organ which has become useless. Man, guided by exact science, must strive to accelerate or anticipate such a result. In spite of the progress of surgery, I do not expect to find in our time that the large intestine will be removed by operation. Perhaps in the distant future such a proceeding will become normal. For the present it is more reasonable to attack the harmful microbes of the large intestine. In the varied flora of that region there exists microbes termed anærobic, because they are able to live in the absence of free oxygen, obtaining what they require by the decomposition of organic matter. Such decomposition is attended by fermentations and putrefactions, and the production of poisons, such as the alkaloids (ptomaines), fatty acids, and even true toxins.

In the human intestines under normal conditions, putrefaction occurs only very slightly, or does not occur at all. But in intestinal diseases of children and of adults, the microbes of putrefaction multiply abundantly and produce copious secretions which inflame the intestinal walls. To avoid these diseases of putrefaction in the case of infants, it has been suggested to use as food only sterilised milk or other foods quite free from microbes. This regimen has proved extremely successful.

In the investigation of the factors that hinder putrefaction, it has been noticed that milk putrefies with considerable difficulty, whereas meat, preserved under the same conditions, decomposes very readily. Investigators have attributed the stability of milk to the presence of casein or of milk-sugar. However, investigations recently made by Bienstock * and confirmed by Tissier and Martelly † have proved the existence of certain microbes that hinder the putrefaction of milk. These are in particular the microbes that sour milk, *i.e.*, cause the formation of lactic acid, and which are antagonistic to the microbes of putrefaction. The latter multiply only in an alkaline medium. The lactic acid microbes produce large quantities of acid and so hinder the multiplication of the organisms of putrefaction. Putrefaction takes place rapidly, in spite of the presence of the lactic acid microbes, if there be added soda to macerations of meat or milk. Such facts explain how it is that lactic acid frequently stops some cases of diarrhœa, and why treatment with lactic acid is so useful in maladies associated with putrefaction of the intestinal contents. It makes intelligible, moreover, the medicinal value of fermented milk.

Rovighi,‡ an Italian physician, drank daily a litre and a half of kephir, a preparation made by subjecting milk to lactic acid and alcoholic fermentations. He found that in a few days the products of intestinal putrefaction in his urine either disappeared or were greatly reduced.

It is plain, then, that the slow intoxications that weaken the resistance of the higher elements of the body and that strengthen the phagocytes may be arrested by the use of kephir, or still better of soured milk. The latter differs from kephir in that it contains no alcohol, and alcohol in course of time diminishes the vitality of some important cells in the body. The presence of a number of the lactic acid bacteria is inimical to the growth of the bacteria of putrefaction, and so is of great service to the organism.

---

* "Archiv. für Hygiene," vol. XXXIX., p. 390. 1902.

† "Annales de l'Institut Pasteur," p. 865. 1902.

‡ "Zeitschrift für Physiologische Chemie," vol. XVI., p. 43. 1892

But it is not enough merely to introduce useful microbes into the body. We must also prevent the entrance of "wild" microbes, many of which are harmful. Soil, especially when it has been manured, contains large numbers of microbes, some of which are harmful. Bienstock found that the soil of the strawberry-beds in his garden contained the bacilli of tetanus. For three weeks he swallowed some of this soil, but found that the bacteria were destroyed in his intestines, which he attributed to the action of the normal bacterial inhabitants of the alimentary canal. It is probable that if this arresting action were weakened the body would be infected by tetanus from spores of the tetanus microbe swallowed with earth or strawberries or green vegetables. Moreover, besides the organisms of tetanus, there are many other dangerous anærobic bacteria in manured garden soil.

Obviously we should eat no raw food, but confine our diet rigidly to food that has been thoroughly cooked or sterilised. The exclusion of "wild" microbes and the introduction of beneficial microbes, such as those of lactic acid fermentation, must be of great service to health. I know of individuals who have derived great benefit from such a regimen.

Science, even in its present imperfect condition, has many weapons by which to prevent or at least diminish the slow and chronic poisoning of the organism that leads eventually to the degeneration of the higher elements. When these elements are being destroyed by syphilis or alcoholism the struggle must be directed against these evils. It is long since we have known how to do this; that success has not been greater is due to the carelessness of the people who are concerned.

To strengthen the resistance of the higher elements and to transform the "wild" population of the intestine into a cultured population, these are the means by which the pathological symptoms may be removed from old age, and by which, in all probability, the duration of the life of man may be considerably increased.

If it be found impossible to eliminate all the harmful microbes from the flora of the intestines, those that are refractory may be rendered harmless by appropriate serums. We know already a serum that is specific against the microbe of botulism, an organism capable of exciting serious disturbance if it gain entrance to the alimentary canal.

Our inmost convictions assure us that life is too short, and since the remotest ages attempts have been made to prolong it. I need hardly mention the quest of the Middle Ages for an elixir of life, but many thoughtful men have occupied themselves with the problem.

Descartes, who was deeply interested in the subject, believed himself to have found a mode of lengthening human life. Bacon published a tract on life and death, and in it gave advice as to how old age might be reached; blood-letting and the use of saltpetre were parts of his specific.

One of the oldest methods in the world consisted in bringing old men in contact with the bodies of young girls. David, King of Israel, employed this method, which at a much later period came into fashion.

Eighteenth-century quacks proclaimed a number of specifics, among which was the "holy water" of Saint Germain, an infusion of senna, merely purgative in its effects. It is certain that some of the medicines used for the purpose, by emptying the large intestine, decreased the bacterial flora, and so checked the formation of the poisons that are harmful to the higher elements.

Hufeland,* a well-known German professor, published towards the end of the eighteenth century, a work called "La Macrobiotique"; or, "the Art of Prolonging Human Life." This treatise had a great vogue in its day, and contained many interesting and just observations. Besides advocating cleanliness and moderation, Hufeland advised that "we should use vegetable rather than animal food, as animal food was more liable to putrefaction, whilst vegetable substances contained an acid principle that retarded our mortal enemy, putrefaction." † Here the physician of a day long past anticipated one of the discoveries of modern science.

In our time scientific men have not ceased to concern themselves with the prolongation of human life. Professor Pflüger, of Bonn, one of the most distinguished of living physiologists, has published an essay ‡ in which he gave the results of his inquiries into this subject. He first stated that investigations into the habits of those who had attained a great age did not give information sufficiently exact. Pflüger laid stress on the means of avoiding infectious maladies, and summed up as follows: "Finally, I can do no better than to associate myself with the advice given in all the treatises on the prolonging of life: avoid the things that are harmful and be moderate in all things."

A year later, a well-known German physician, Dr. Ebstein§ published a very careful treatise on the same subject. He had been struck by the fact that among those who have reached a great age, there have been several who had led an exuberant life, full of excesses, notably in the consumption of alcohol. None the less, Ebstein advised either a complete avoidance of alcoholic liquor, or at the most an extreme temperance in the use of it. He prescribed in addition the simplification of the conduct of life and the avoiding of anything that is unwholesome.

---

* "L'Art de Prolonger la Vie Humaine." French translation of German Second Edition. Lausanne, 1809.

† *Loc. cit.* p. 296.

‡ "Ueber die Kunst der Verlängerung des Menschlichen Lebens." Bonn, 1890.

§ "Die Kunst das Menschliche Leben zu Verlängern." Wiesbaden, 1891.

Study of such works, which are written in a scientific spirit, convinces me that a science of the prolongation of life could be built up. An exact investigation of the phenomena of old age would contribute to this object. At any rate, we cannot set aside as chimerical plans to make old age a natural process, and one easy to bear. I believe, moreover, that attempts to prolong life deserve to be encouraged, the more so as instances of longevity are already numerous.

Quite a number of cases of centenarians who have preserved intellect and vigour until death have been recorded. It is unnecessary to relate the histories of these persons, of whom some attained such ages as 120, 140, and even 185 years (Saint Mungo of Glasgow). My friend, Professor Ray Lankester,* thinks that such unusually old persons are monstrosities comparable with those who have attained a gigantic stature. But centenarians are more numerous than giants, and while the latter exhibit marked signs of pathological weakness the former surprise us by their health and vigour.

The longevity of the Israelites recorded in the Old Testament is well known. No doubt there is much exaggeration in these naïve records. Was it an error of exaggeration to impute an age of 969 years to Methusaleh, or of 595 to Noah, or were these ages reckoned on a different basis? Henseler † suggested that in these cases each season was counted as a year, so that the age of Methusaleh was really only 242 years, a length of life not so vastly greater than ages recorded in modern times.

---

* "The Advancement of Science," p. 237. London, 1890.

† Quoted by Pflüger in "Ueber die Kunst der Verläng.," p. 14.

There is evidence to show that in somewhat later Biblical times ages were reckoned in our years. Thus in the Book of Numbers (i. 3, 20, 22) reference is made to those "From twenty years old and upward, all that are able to go forth to war in Israel." The limit of age given shows clearly that the years counted were our years. This interpretation is supported by many other passages in the Pentateuch, notably where annual harvest feasts are spoken of. We may therefore accept as probable the assignment of such ages as 100 or 120 years to several Biblical personages, such as Aaron, Moses, and Joshua. And the words put in the mouth of Jahveh may be accepted as important evidence: "And the Lord said, My spirit shall not always strive with man, for that he also is flesh: yet his days shall be an hundred and twenty years." *

The longevity of that remote period must have surpassed the age of the present time. From the circumstance that the greatest number of deaths occurs at the age of seventy years, Ebstein † has inferred that seventy years is the normal duration of life. Although there is no doubt but that the duration of human life has become longer in the nineteenth century, we must believe that it was still longer in Biblical times, a fact that is not particularly surprising.

I have called attention to the important influence of syphilis in inducing premature and pathological old age, as that disease is a chief cause of arterial sclerosis and degeneration of the higher elements of the body. Syphilis has an influence still more serious because its effects are inherited. Now although the Bible refers to diseases of

---

* Genesis vi. 3.

† *Loc. cit.* p. 12.

the genital organs and lays stress on circumcision, there is no direct evidence in it as to the existence of syphilis. Ebstein, in a treatise on the medicine of the Bible,* is confident that there is no reference to syphilis in that Book. Moreover, in the ancient world generally, syphilis was either unknown or existed only in an attenuated form. Haeser,† the author of the best modern treatise on the history of medicine, thinks that if syphilis did exist in the ancient world, it occurred in a localised form and did not become a general disease of the system as is the case among the moderns.

Humanity would make a great stride towards longevity could it put an end to syphilis, which is the cause of one-fifth of the cases of arterial sclerosis. The suppression of alcoholism, the second great factor in the production of senile degeneration of the arteries, will produce a still more marked extension of the term of life. Scientific study of old age and of the means of modifying its pathological character will make life longer and happier. Although modern knowledge is still imperfect, there is no reason to be pessimistic on the subject of old age.

---

* "Die Medizin im alten Testament." Stuttgart, 1901.

† "Lehrbuch d. Geschichte der Medecin," vol. III., p. 223. Jena 1878.

CHAPTER XI

INTRODUCTION TO THE SCIENTIFIC STUDY OF DEATH

Theory of the immortality of lower organisms—Immortality of the sexual cells in higher organisms—Immortality of the cellular soul—Occurrence of natural death in the case of certain animals—Natural death in the Ephemeridæ—Loss of the instinct of preservation in adult ephemerids—Instinct of life in the aged—Instinct of natural death in man—Death of old men in Biblical times—Changes in the instincts of man and lower animals

From what I have said in the last chapter, it is plain that, perhaps before very long, it will be possible to modify old age. Instead of retaining its existing melancholy and repulsive character, it may become a healthy and endurable process; it may also be that the duration of life will be prolonged. However, it may be asked, what shall we gain by attaining the age of 100 or 120 years instead of 70 or 80, if there still remain for us the appalling fate of the inevitable annihilation of death. Marcus Aurelius said that he who makes a long journey and he who makes it short, alike meet death at the end; and that once they are over, three years or a century are much alike. Such assertions, however, do not take into account the difference in the values we set on a thing at different ages. A man of the age of twenty-five years and one fifty years old reason differently, and are affected differently by the same surroundings. The outlook on life changes in the same individual as he gets on in years. Young people judge of their impressions by comparison with their ideals, and as the latter are very high, they are dissatisfied with things as they really are. They are exacting, and discontented with what they can get out of the real world; grown up people and those of advanced years are more easily satisfied because they have a clearer knowledge of the true value of things. As I have already had occasion to point out in a previous chapter, the young are more inclined to pessimism than the old. We see, then, that appreciation of life changes with age. It is the same with regard to death. It has often been said that life is only a preparation for death. Cicero said, "From our youth upwards we must accustom ourselves to face our last moments without fear. If not, there is an end to peace, since it is quite certain that we must die." Philosophy has been called the art of preparing for death.

Before considering in what direction science may direct our steps towards solving the problem of death, which in the words of St. Paul is the "last enemy to be destroyed," let us see how much is known about it.

We are so accustomed to look upon death as something natural and inevitable, that it has long since come to be regarded as inherent in organisms. However, when biologists investigated the matter more carefully, they failed to discover any proof of the accepted doctrine. Observation of members of the lowest grade of animal life, such as infusorians and other protozoa, has shown that these reproduce by simple division, and in a very short time multiply to an astonishing extent. Generation succeeds generation, with the utmost rapidity and without the intervention of death; no single corpse appears in the swarming masses of animalculæ. From such facts, which are extremely easy to confirm, several biologists, and in specially Bütschli and Weismann,* have deduced an immortality of the unicellular organisms. When an infusorian has divided, each daughter organism rapidly completes itself and sets about again dividing in the fashion of its parent. The process may be more complicated, as in the cases where a single organism breaks up into several portions each of which contains an essential part of the parent organism. Many unicellular organisms reproduce in such a fashion, and as each animal divides simultaneously into a number of individuals of the new generation, the individuality is destroyed. It is possible to admit with Götte † that such a process is natural death, although there is no actual destruction and no corpse.

In any event it cannot be disputed that lower organisms are not subject to the natural death that comes inevitably to man and the higher animals. It has been suggested that the debility of infusorians after a rapid series of divisions, and before conjugation, is to be interpreted as natural death. But the rejuvenescence that follows conjugation is incompatible with such an interpretation. Moreover, when conjugation does not occur, and the debility leads to death, the deaths must be regarded as accidental.

The theory of the immortality of unicellular organisms is now generally accepted. However, there are animals, higher in the scale of life, to which natural death does not come. Among these occur certain forms of considerable complexity, composed of many organs and very many cells, such as many polyps, and some worms, especially annelid worms. Some annelids (Fig. 17) reproduce by transverse divisions very actively. "Throughout the summer," said E. Perrier,* "the Naïdimorpha are devoid of genital organs, and apparently (according to unpublished observations of Maupas), they may be kept alive for several years, and perhaps indefinitely, in this sexless condition." This certainly may be regarded as a case of immortality due to the indefinite power of regeneration possessed by a complex animal.

---

* "Essays on Heredity and Kindred Biological Problems." Authorised Translation, Oxford, 2 vols., 1889–92.

† "Ueber den Ursprung des Todes." 1893.

The facts that I have cited show that death is not necessarily inherent in living organisms. Naegeli,† a well-known German botanist, has asserted even that natural death does not exist in nature. He points out that trees, more than a thousand years old, perish not by natural death, that is to say, by the gradual decay of their vitality, but by some catastrophe.

The age of the famous dragon-tree of the Villa Oratava at Teneriffe, admired by Von Humboldt, was estimated at several thousand years. Its trunk was hollow, but the huge monster continued to flourish until it was overthrown by a storm.

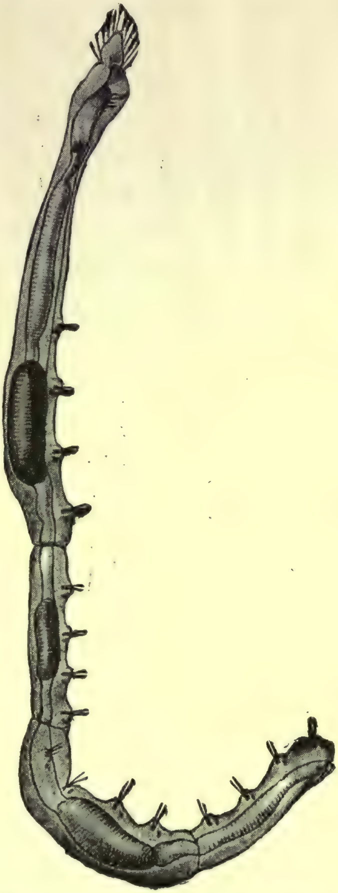

FIG. 17.— *Chætogaster* about to divide into four (from a drawing by M. Mesnil).

---

* "Traité de Zoologie," p. 1713.

† "Abhandlungen der k. bayrischen Akademie d. Wissenschaften," 1865.

It was only by a catastrophe that the long-lived giant perished. The Baobab is reputed to live for five or six thousand years.

In a recently published essay, Jacques Loeb,* a distinguished biologist in Chicago, has made a study of natural death, and has come to the conclusion that there is no good evidence for its existence. He has observed that ripe, but unfertilised eggs of sea hedgehogs (Echini) die a few hours after they have been discharged. Loeb thinks that this may be a case of natural death, but I cannot agree with this opinion, as an egg that has not been fertilised by a spermatozoon may be compared with an organism deprived of its nutrition and so dying of starvation. In both cases death is purely accidental and could have been avoided.

If natural death does exist, it must have appeared on the face of the earth long after the appearance of life. Weismann has suggested that death arose as an adaptation for the advantage of the species, that is to say, in relation to the surrounding conditions of existence, and not as an absolute necessity inherent in the nature of the living substance. He thought that as worn organisms are no longer suited for reproduction or for the struggle for life, natural death was due to natural selection, it being necessary to maintain the species in a vigorous state by weeding out the debased individuals. But the introduction of death for that purpose was superfluous, since the debility caused by old age in itself would eliminate the aged in the course of the struggle for existence. Violent death must have appeared almost as soon as living things came into being. The infusorians and other low organisms, despite their potential immortality, must have been subjected perpetually to violent death, falling victims to larger and stronger organisms. It is impossible to regard natural death, if indeed it actually exist, as the product of natural selection for the benefit of the species. In the press of the world natural death rarely could come into operation, because maladies or the voracity of enemies so frequently cause violent death.

---

* "Archiv für die gesammte Physiologie." Vol. XCIII., p. 59, 1902.

No doubt a certain number of deaths are recorded in statistics as being due to old age, without visible malady. Sometimes decrepit old men feel no pain and seem to fall quietly into their eternal sleep; but autopsy reveals serious lesions of the internal organs. There is reason to believe that even such deaths are in reality violent and are usually caused by infectious microbes. The general effect on the mind produced by examination of the collected facts is not an acceptance of the view that natural death is essentially inherent in living organisms, but the production of a wish to discover if there be any real proof of its existence.

For some time natural death has been ascribed only to the parts of the body that are of use in the individual life. Those cells, the function of which is to secure reproduction of the species, are, like unicellular organisms, potentially immortal. The egg-cell of the female is transformed into a fœtus, and so is the starting-point of the new generation, while the sexual cells of the new generation give rise to the third generation, and so on, in an endless chain of life. The greater number, by far, of the eggs and spermatozoa perish; but their death is not natural but violent, being due to harmful external agencies. An infinitesimal minority of the sexual cells survive indefinitely in the successions of generations.

Scientific proof exists, therefore, that our bodies contain immortal elements, eggs or spermatozoa. As these cells not only are truly alive but exhibit properties that are within the category of psychical phenomena, it would be possible to build up a serious thesis on the immortality of the soul.

Observations on protozoa, and especially on the infusorian group of protozoa, show that these simple beings, each of which is composed of no more than a single cell, possess a high degree of sensibility. They select their food, distinguish living from dead animalculæ,* seek out their mates for conjugation, avoid danger, and hunt their prey; in fact, they are in possession of a set of qualities that must be included in psychical phenomena. Although such phenomena are very much lower in the case of the infusorians than in the case of higher animals, it is possible to speak of the soul of protozoa. Moreover, as the body is immortal by reason of its indefinite power of reproduction by division, the soul also of these creatures is immortal. However, the soul is so primitive that it is impossible to speak in definite terms about it.

As the sexual cells of the human body are immortal, like the protozoa, the problem arises if these too be endowed with an immortal soul. Our existing knowledge makes it impossible to doubt that ova and spermatozoa have sensibility in a degree as high as that of the protozoa. The ova shed secretions that arouse the sensibility of the spermatozoa, and the latter, directed by this specific "odour" (the occurrence being known technically as chemotaxis), make their way to the ovum and penetrate it. Some substances, arousing the spermatozoa into activity and movement, attract them, others repel them. The phenemona of chemotaxis were shown for the first time in the case of cryptogams by Pfeffer, the distinguished botanist, and since then the male cells of many plants and different kinds of animals have been proved to possess sensibility.

---

* Salomonsen, in "Festskrift ved indvielsen af Statens Serum Institut," vol. XII. Copenhagen, 1902.

When ova and spermatozoa succeed in conjugating, they produce an individual of the next generation, to which they transmit what Haeckel has called the "cellular soul." * This soul, then, is really immortal, inasmuch as the bodies of the reproductive cells are immortal.

Although it is true that our bodies contain elements endowed with immortal souls, it by no means follows that our conscious souls are immortal. In an earlier chapter, I have already pointed out that the psychical phenomena of many of the cells of our body and the cellular souls of these are outside our consciousness. We have no consciousness of the perpetual battle waged by the phagocytes against the microbes that endeavour to obtain a foothold in our tissues. None the less the phagocytes are elements endowed with mobility and sensibility and possessing a cellular soul like that of the protozoa.

A woman has no consciousness of the numerous spermatozoa, with their cellular souls, that enter her body, nor of those that fertilise her egg-cells; she is even without consciousness of the much more highly developed soul of the foetus. A child before birth possesses psychical qualities much more numerous and more perfect than those of the reproductive cells. It is capable of responding to certain sensations and of performing movements. A child, in the later months of its prenatal existence, possesses the senses of touch and taste and, within limits, the sense of

---

* "Gesammelte Populäre Vorträge." Bonn, 1878.

sight.* This soul is outside the consciousness of the mother. The mother cannot even tell by her consciousness if she bears under her girdle one or two embryonic souls. And so the immortality of the cellular soul has no relation to the problem of death.

It is a common opinion that only the reproductive cells of man and animals are immortal, and that the other elements of the body are mortal, the latter, if they escape violence, dying a natural death. A contrast has been drawn between the mortal cells in which is resident the life of the body and the immortal cells on which the species depends. However, when non-reproductive cells possess the power of regeneration, it is impossible to deny their immortality. When a polyp or a worm reproduces by division, a large number of cells go to form the new individual, and these cells are immortal in the fashion of the infusoria.

Immortal animals occur only among the lower invertebrates. The power of regeneration fades away in the higher ranks of the scale of life. Whilst worms may be divided in several pieces, each piece being capable of regeneration so as to form a new worm, when molluscs are cut they display only a limited capacity for regeneration. If the antennæ of a snail be amputated they will be renewed, but if the whole creature be cut in pieces death follows. Some of the lower vertebrates, such as newts and salamanders, can renew the tail and the limbs, but they cannot reproduce by division. Birds and mammals, the higher vertebrates, have very little power of regeneration, and tail and limbs are never reformed in their cases.

It seems to be the case that the advance in the general organisation of animals has involved a loss in the reproductive capacity of the cells and tissues. Even in the highest animals, some organs, such as the liver, still possess regenerative capacity; but, on the other hand, many cells have lost the power of regeneration completely. The nervous cells, in particular, which are the highest and most perfectly organised elements of the body, cannot reproduce themselves. After their initial appearance in the course of embryonic development, they pass their lives without regenerating or reproducing. In acquiring the highest qualities, that is to say, their psychical activity, they have lost completely the power of reproduction, the distinctive feature of immortal cells. If cells doomed to natural death really exist, it is in the nervous tissues that we must look for them.

---

* Preyer, "Die Seele des Kindes," 1884, and "Specielle Physiologie des Embryo," p. 547. 1885.

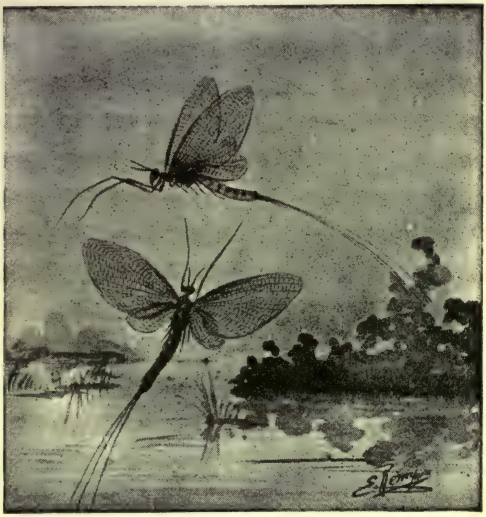

FIG. 18.—Ephemerids.

The existence of natural death in the animal world cannot be denied, but it is very rare. The best example is that of the curious insects known universally as ephemerids (Fig. 18). Swarms of these delicate and graceful insects are to be seen in the summer months round lights. The perfect insects emerge from water, in which the six-legged larvæ feed on the organic débris contained in fresh water. The larvæ are not predaceous, and escape from their numerous and hungry foes by agility. They are long-lived, some of them passing two or three years in the mud of streams, and in the end become winged insects after a rapid metamorphosis. Near Paris, anglers have a popular name (*manne*, manna) for one species (*Palingenia virgo*) which emerges in swarms after sundown from the waters of the Seine and Marne. The swarms fly in huge numbers, like heavy snow-flakes, for a very short time, and then fall into the water (Fig. 19). The flight of these insects lasts only an hour or two, and then, in an enfeebled condition, they fall down in vast numbers. They are attracted by the lanterns lighted by fishermen, and are collected to be used as bait. The life in the winged condition is truly ephemeral and lasts no more than a few hours. The structure of the insect is adapted to this short life. The larvæ have powerful jaws, used in the mastication of food; the winged insects possess only vestiges of jaws. They are unable to feed, and so are adapted only for the briefest existence. Their hour of aerial life is devoted to love. As soon as they emerge the males and females unite, and the packets of eggs, which are deposited at once, fall into the water, and in a few weeks the young larvæ hatch out.

The mode of life and the organisation of the adult ephemerids show plainly that they are adapted to natural death. Death comes to them not because they are without food, or beause the environment fails to provide something necessary to life, but merely because they emerge from the larval state in a non-viable condition, without the organs necessary to the maintenance of life.

Once it is granted that natural death actually exists, it is necessary to study its mechanism as closely as the existing state of knowledge permits. To exclude the

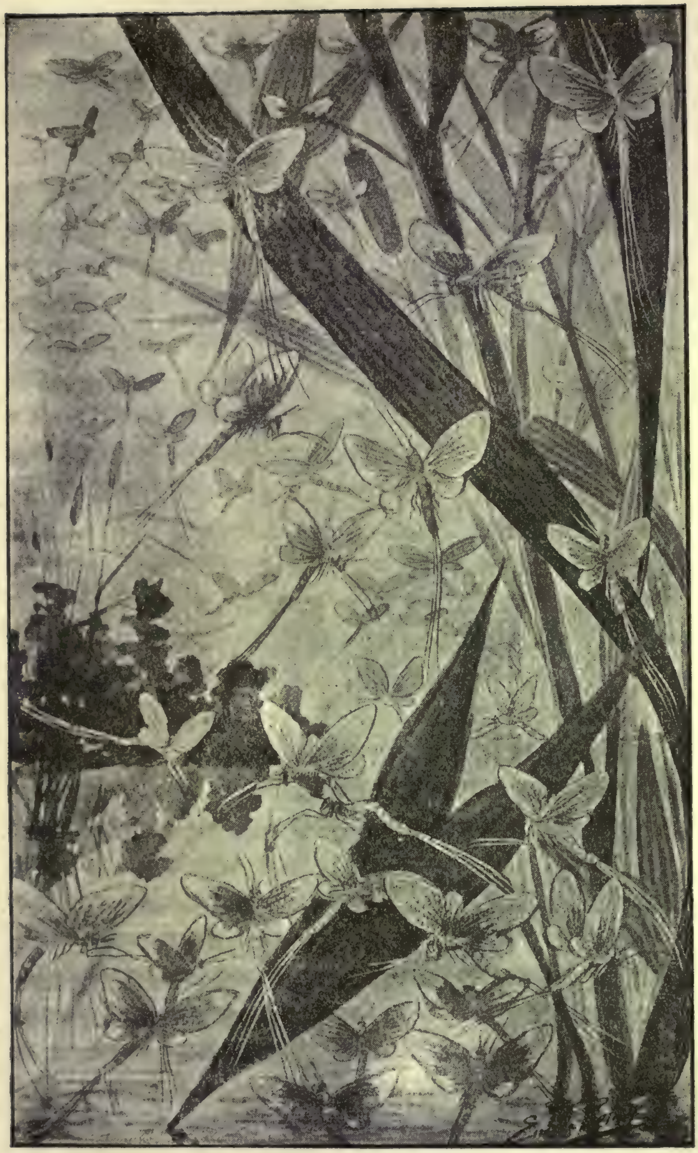

FIG. 19.—Swarms of *Palingenia virgo.*

possibility of the death having to be interpreted as violent, it would be necessary to know that some very rapid infectious disease does not attack these insects as soon as they emerge from the water. This possibility, although remote, must be examined. Instances are known of large numbers of insects dying very rapidly as the result of attack by a species of mould which causes an epidemic. Every one has seen, especially in autumn, dead flies anchored to the window pane by a little tuft of white fluff. As so many individuals die about the same time, we might be disposed to assign the fact to natural death. The actual cause, however, is an infectious and fatal disease caused by a parasitic mould.

The occurrence of some terrible epidemic may be excluded from consideration in the case of ephemerids. I have made investigations which show that such an epidemic does not occur. The bodies of the dying ephemerids contain no microbe which could be the cause of death. Their death must be regarded as natural, as the result of their organisation, as essentially a part of the nature of the insects. Among the cells of their body there are many active phagocytes. Is it possible to attribute death to ravages that these cells may cause among the higher cells and tissues? Microscopic examination, so far from supporting such a possibility, shows that the organs are quite normal in their intimate structure. The brain and central nervous system, the muscles and other organs, show no signs of that invasion by phagocytes found in cases of senile degeneration. In this example of natural death there is certainly no possibility of phagocytic intervention

Some biologists have suggested that the rapid death of ephemerids and of some other insects is due to debility caused by the great effort of depositing the male and female sexual cells. On this supposition, the case would be analogous to the shock which is sometimes the consequence of a surgical operation. This hypothesis, however, may be excluded, for among the dead ephemerids there are many males that have not united with females. Among ephemerids males are much more numerous than females; many males have no opportunity of undergoing the sexual shock and of emptying the reproductive organs, and these, none the less, die as rapidly as the others.

As yet we do not know if all the tissues of the ephemerids die simultaneously in natural death. Most probably the cells of the nervous centres perish first, and so bring death on the others. The investigation ought to be made.

Death comes to the ephemerids in the midst of love, at the moment when their sexual instincts are satisfied. It would be very interesting to know the sensations of these creatures as they feel death come on them in the act of reproduction. Naturally it would be impossible to obtain a full answer to the question, but many interesting facts regarding it may be ascertained. All the ephemerids, not only those the life of which is so brief, but those that live for several days (*Chloë*, for instance), are extremely easy to capture. It is unnecessary to take them unawares or to use a net as in the case of flies, wasps, and many other insects. Ephemerids may be taken with the fingers in the simplest way, because they offer no resistance and show no desire to escape, although they have six legs and two or four wings. This is not an isolated case, for some other insects (as, for example, winged ants and aphides) allow themselves to be captured with the same carelessness.

Although the adult ephemerids are careless, the wingless larvæ are timid. When a tube is brought near them, among the water plants, with the object of capturing them, they rapidly move off. It often requires much patience and quickness to capture these larvæ (Fig. 20). The instinct of preservation of life displays itself by rapid flight.

It is remarkable that the adult insect has lost the instinct of self-preservation. If it be touched it may move a short distance off, but it does not take to flight although its wings are very large, and its body, which of itself weighs little, is still lighter because the digestive tube is filled with air and not with food. As a rule, an ephemerid that has been touched does not even move off, but allows itself to be captured without any resistance. It would not be accurate to say that the larva's instinct of self-preservation has been replaced in the adult by an instinct for death; but it must be admitted that the instinct of preservation has been totally lost. The lack of resistance cannot be explained by any defect in the organs of sense. Not only are the eyes of the larval stage fully preserved in the adult, but the adult males have enormous eyes to enable them to recognise the female in the turbulent flight which takes place at the close of the day. Ephemerids of all ages possess well developed tactile organs, and it is thus in spite of a highly organised sensory system that the adults offer no resistance to enemies.

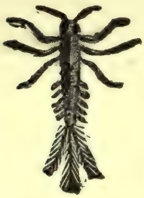

FIG. 20.—Larva of an ephemerid (*Chloë rufulum*).

It is no mere accident that the most striking examples of natural death occur among insects, for these creatures display an unusual stability in their cellular structure with a corresponding lack of the power of regeneration, in these particulars resembling man and the higher animals. The cells of the nervous system are very complex, and are well adapted for the highest function, that is to say, the psychical function. These highly endowed cells, however, are devoid of the power of reproduction. Many experiments have been made in relation to this, and it has been proved clearly that in cold-blooded vertebrates the brain and spinal cord with the nerve cells contained in them are capable of regeneration, whilst among mammals only extremely rare cases are known in which there has been any regeneration of the nervous elements. It is to be expected, then, that cases of natural death occur in the higher animals and especially in man. However, no case is known so plain as that presented by the ephemerids. I have already stated that of deaths apparently due to senile debility in man, a large proportion are certainly due to various infectious diseases that affect the old, such as pneumonia and nephritis. Close examination of the tissues confirms this conclusion, for the destruction of the higher elements by phagocytes produces what is really violent death and not a natural death like that of the ephemerids.

Natural death in man is probably a possibility rather than an actual occurrence. Old age is not a true physiological process but exhibits many morbid characters. That being the case, it is not surprising that it seldom ends in natural death. It is probable, however, that natural death occasionally occurs in very old men.

Attempts have been made to estimate the natural limits of human life. Flourens * based a calculation on the duration of the period of growth. If the latter be taken as one fifth the natural life, then human life ought to last a century. As centenarians are rare, the vast majority of deaths, which happen before that age has been reached, must be regarded as violent or accidental. The rule of Flourens, however, is arbitrary, and there is no evidence to show that it is exact. Probably in the human race, as

---

* "De la longévité humaine," Second Edition. Paris, 1885.

in the case of ephemerids, the natural duration of life varies and cannot be expressed by a definite figure. In most cases it ought to be more than a hundred years, and only in rare cases ought it to be much less than that term. Probably there is a variation in the duration of life just as there is a variation of the date of sexual maturity for which rules may be laid down but not without anticipating numerous exceptions.

The existing pathological character of old age vitiates all conclusions as to natural death, and it is still impossible to be exact in speaking of that subject. It is known that certain organs and tissues remain alive for some time after death. In the case of certain infectious diseases, the heart may be removed from a human body more than thirty hours after death, and if placed under proper conditions will renew its life, and beat for several hours. The white corpuscles, the spermatozoa and the cilia of a corpse, may retain their power of movement. Does this also happen in the rare cases of natural death ? That question must be answered in the future. The most important question relating to natural death is the following : Is the appearance of natural death in man accompanied by the disappearance of one instinct, the instinct of self preservation, and by the appearance of another instinct, the instinct of death ? Do the phenomena of the ephemerids give us any indication as to this ? An exact answer is not to be expected. As old age is generally what may be called an unnatural phenomenon, it is extremely rare for persons to approach the age of natural death with their faculties unclouded. I have had under observation a centenarian old woman, who still remembered some incidents of her youth ; in her the desire to live was still strong, but her intellectual faculties were partially dim. Moreover, her brain, of which I have already spoken (p. 241), showed a marked degeneration of the nerve cells due to the activity of macrophags.

I have obtained much information about a centenarian who was alive in Rouen in 1900, but a single glance at her photograph was enough to show that she no longer was in full possession of intelligence.* She was infirm in many ways. So also, Chevreul, the celebrated chemist, who died at the age of one hundred and three years, showed not the faintest wish for death; he clung to life, but his mental powers had grown weak.

The cases to which I have referred are typical, but there are exceptions worthy of close attention. Tokarski, in the essay on the fear of death, to which I referred in the sixth chapter, quoted the case of a female centenarian who stated as follows: "If you come to live as long as I have lived, you will understand not only that it is possible not to fear death, but to feel the same need for death as for sleep." A new feeling had come into existence in the very old person, a feeling incomprehensible to those less old. Apparently this was a case in which the instinct of natural death had appeared in a centenarian whose mental faculties had been retained in a sufficiently perfect state.

I wish very much that I had myself been a witness of this old woman's remarkable instinct in even one case of the many that I have observed. But all that have been pointed out to me as subject to this new desire have turned out to have been possessed of very different ideas. Some were old invalids, weary of pain and ready to exchange the sorrows of life for death, but who would have preferred to be healed and to live on in comfort. When the possibility of recovering health was suggested to them, they showed signs of pleasure and of the renewal of hope.

---

* *Journal de Rouen*, September 23, 1900. Article by Georges Dubos

Investigations that I have made in homes for the aged have led to negative results on this subject. No case showed the slightest sign of the approach of the instinct of death. However, I have learned from Dr. Fauvel of one case to add to the instance noticed by Tokarski. It was the case of an old lady whose health and circumstances were comfortable and who before her death showed a real desire for it and stated it in much the same language as that quoted by Tokarski. In Fauvel's case, however, the old lady had reached the age of only eighty-five years. It seems probable that this was a second genuine case of the appearance of the instinct of death, and it is therefore interesting to notice that that instinct, like the sexual instinct, is subject to variation in the date of its appearance.

In my search for instances of the instinct of death, I made use of the large collection made by Lejoncourt,* but found that the information given by this author was very incomplete as to the mode of life and the last moments of his cases.

The Bible testifies to the frequency of old age in ancient times and to the complete preservation of the faculties in the aged. It also contains some references that may be interpreted as instances of the instinct of death. I may take its account of the death of some of the patriarchs. "And these are the days of the years of Abraham's life which he lived, an hundred threescore and fifteen years. Then Abraham gave up the ghost, and died in a good old age, an old man, and *full of years*."† "And the days of Isaac were an hundred and fourscore years. And Isaac gave up the ghost, and died, and was gathered unto his people, being old and *full of days:* and his sons Esau and Jacob buried him."‡ "After this lived Job an hundred and forty years, and saw his sons, and his sons' sons, even four generations. So Job died, being old and *full of days*."* It is probable that the phrase "old and full of days," which sounds strange in our ears, simply refers to the instinct of death, developed in well-preserved old men who had attained ages of from 140 to 180 years.† The Biblical phrase is not merely a commonplace phrase applied to the death of celebrities for the references to deaths of other persons were put in different language. "And these are the years of the life of Ishmael, an hundred and thirty and seven years: and he gave up the ghost and died; and was gathered unto his people."‡ "And Jacob lived in the land of Egypt seventeen years: so the whole age of Jacob was an hundred forty and seven years."§ "And Aaron was an hundred and twenty and three years old when he died in Mount Hor."|| "And Moses was an hundred and twenty years old when he died; his eye was not dim, nor his natural force abated."¶ In only one of these later cases had the individual reached the age of one hundred and forty years, at which age, apparently, the instinct of natural death appeared.

---

* "Galerie des Centenaires anciens et modernes. Paris, 1842.

† Genesis xxv. 7, 8.

‡ Genesis xxxv. 28, 29.

It may seem altogether surprising and improbable to us that an instinct for death should arise in man, since we are imbued with an instinct of an opposite nature. From the facts that I collected in my sixth chapter, it was to be inferred plainly that the desire of life and the fear of death are manifestations of an instinct deep-rooted in the con-

---

* Job xlii. 16, 17.

† It may be that the great longevity of many of the patriarchs, ending in the appearance of the instinct of death, is the cause of the small extent to which the idea of a future life had been developed amongst the ancient Hebrews. (See chap. vii.)

‡ Genesis xxv. 17.

§ Genesis xlvii. 28.

|| Numbers xxxiii. 39.

¶ Deuteronomy xxxiv. 7.

stitution of man. That instinct is of the same order as the instincts of hunger and thirst, of the need of sleep, of movement and of sexual and maternal love. The devotion and care bestowed on their young by female birds and mammals are known universally. And yet these instincts can be reversed. There is no sacrifice of which the mothers are not capable if it serve to save the life or promote the well-being of their offspring. Such devotion is a manifestation of the maternal instinct, which is one of the strongest instincts known to us. And yet that love, so tender and so absolute, lasts only for the time during which the wants of the young need to be satisfied. As soon as the young begin to be independent, the maternal love changes to indifference or to dislike. At the next breeding-period, maternal love reappears again, so that there is a periodic ebb and flow of the instinct.

The new-born babe takes an instinctive delight in the milk of his mother, which seems to him the only good food in the world. As soon as he can show his feelings, his intense satisfaction as he is suckled is plain. But this instinct lasts only during the period of lactation. As soon as the child begins to take different kinds of food, he ceases to be pleased with his mother's milk, and may dislike it for the remainder of his life. Several adults to whom I have offered human milk would not even taste it, so disgusting did it seem to them. And yet the taste had nothing intrinsically disagreeable in it. Here again is an example of a strong instinct that changes completely.

Children often eat to repletion of some kind of substance, and for long afterwards that substance disgusts them instead of being coveted by them. It is said that apprentices to pastry-cooks and makers of sweetmeats are allowed at first to eat as much as they please. They soon come to have a profound dislike for the sweet things that children like so much.

A mother who adores her child, or a child who is extremely fond of sweetmeats cannot understand how any mother could dislike her offspring or any apprentice have a distaste for sweets. In the same way, human beings full of the desire for life, believe more easily in eternal life than in the possibility of an instinct of death. And yet the instinct of death seems to lie, in some potential form, deep in the constitution of man. If the cycle of human life followed its ideal course according to physiological function, then the instinct of death would appear in its time, after a normal life and an old age healthy and prolonged.

In reality, human life is subject from its very beginning to the pernicious disharmonies in the constitution of man. This evil influence increases with the passing of the years and leads to an old age ruined by abnormalities. It is not surprising that under such circumstances men wish neither to grow old nor to die. Old men, in spite of their attachment to life, do not attain the capacity to know all that is good in it, and die, in the fear of death, without having known the instinct of death. They may be compared with unhappy women who have married before their sexual instincts have awakened and who have died in childbirth, without ever having known the real joy of loving. Formerly, the number of women in such a case was large. In some parts of Abyssinia, girls married when they were still very young and before their physical development was mature. According to Hassenstein,* nearly one third of these young women died in childbirth. They quitted life before they had known the true sexual instinct. The advancement of civilisation and of medical knowledge has greatly reduced the number of such unhappy women. We must hope that the progress of knowledge will bring about a similar advance in relation to the instinct of death. With that progress, the number of men who will live until the instinct has been attained will become greater and greater.

---

* Ploss-Bartels, "Das Weib," vol. I. p. 626.

CHAPTER XII

SUMMARY AND CONCLUSIONS

Disharmonies in the human constitution as the chief source of our sorrows—Scientific data as to the origin and destiny of man—The goal of human existence—Difficulties in the way of scientific investigation of the problem—What is progress ?—Difficulty of including the whole human race in a scheme of progress and morality—The instincts of life and of natural death—Application to real life of the doctrines set forth in hits book

MAN, who is a descendant of some anthropoid ape, has inherited a constitution adapted to an environment very different from that which now surrounds him. Man is possessed of a brain very much more highly developed than that of his ancestors, and has entered on a new path in the evolution of the higher organisms. The sudden change in his natural conditions has brought about a large series of organic disharmonies which become more and more acutely felt as he becomes more intelligent and more sensitive. And thus there has arisen a number of sorrows which poor humanity has tried to relieve by all the means in its power. The disharmonies in the sexual functions have brought into existence attempted remedies of the strangest kind. The greatest disharmony of the constitution is that of the morbid nature of old age and the impossibility of reaching the instinct of natural death ; this has produced childish and erroneous conceptions of the immortality of the soul and of the resurrection of the body, and many other strange doctrines that have been imposed upon us as revealed truth.

Human intelligence, in the course of its progressive evolution, has rebelled against these naïve palliatives. Finding the restoration of the much-desired harmony beyond its power, humanity became resigned to a passive fatalism, and believed even that the existence of man was a kind of bad joke, a *faux pas* in the evolution of sentient organisms. Exact science, developing slowly, but surely, has at last tried to master the situation. Moving step by step, passing from the simple to the complex and from the particular to the general, science has established a set of truths which all the world must accept.

Humanity in its misery has put question after question to science, and has lost patience at the slowness of the advance of knowledge. It has declared that the answers already found by science are futile and of little interest. From time to time it has preferred to turn back, and to delude itself with the beautiful mirages offered by religions and systems of philosophy.

But science, confident of its methods, has quietly continued to work. Little by little, the answers to some of the questions that have been set have begun to appear. Whence do we come ? science has been asked unceasingly. Is not man a being unlike other beings, made in the image of God, animated with the divine breath, and immortal ? No, science answers. Man is a kind of miscarriage of an ape, endowed with profound intelligence and capable of great progress. His brain is the seat of processes that are very complex, and much higher than those of other animals, but these functions are incompatible with the existence of an immortal soul.

Whither are we going ? That question above all other things has absorbed the attention of man, and naturally so, for it is less important to know our origin than to know our destiny. Does death mean absolute extinction, or is it a gateway leading to a new and everlasting life? And if the latter alternative be untrue, how are we to face inevitable death?

Science cannot admit the immortality of the conscious soul, for consciousness is a function of special elements in the body that certainly cannot live for ever. Immortality exists only for very low organisms that renew their lives by repeated divisions with complete regeneration, and that have no highly developed consciousness.

Death brings absolute extinction, and it seems unbearable because of the condition in which it surprises us. It comes before man has finished his physiological development, and when the instinct of life is still strong.

Ever since man has begun to look a little beyond his daily and immediate wants, he has asked if there be a goal for his life, and what that goal may be. As he has generally failed to find such a goal, he has gone the length of believing life to be a mere accident, and of thinking it idle to seek a goal. He has formed depressing and pessimistic conclusions. Humanity may be compared to a boy that has not yet acquired the sexual instinct, but has asked the meaning of the reproductive organs. As these organs play no part in the functions of his life, he might easily think their existence not only absolutely useless but absurd.

Man, because of the fundamental disharmonies in his constitution, does not develop normally. The earlier phases of his development are passed through with little trouble; but, after maturity, greater or lesser abnormality begins, and ends in old age and death that are premature and pathological. Is not the goal of existence the accomplishment of a complete and physiological cycle, in which occurs a normal old age ending in the loss of the instinct of life and the appearance of the instinct of death.

The pessimistic school has often spoken of death as the true goal of human life. Schopenhauer,* for instance, said: "Death must really be regarded as the true goal of life; when it comes it at once adjusts all that has been preparing in the course of life." Baudelaire† has exactly the same idea in his verse:

> "C'est la mort qui console, hélas! et qui fait vivre;
> *C'est le but de la vie*, et c'est le seul espoir
> Qui, comme un élixir, nous monte et nous enivre
> Et nous donne le cœur de marcher jusqu'au soir."

Alas! it is death that comforts and gives us life; it is the goal of our days, it is our only hope that like a wine goes to our head and makes us drunk, and puts heart into us to journey on till the night."

The normal end, coming after the appearance of the instinct of death, may truly be regarded as the ultimate goal of human existence. But before attaining it, a normal life must be lived: a life filled all through with the feeling that comes from the accomplishment of function. Knowledge of the true goal of life clears up the problem and shows us the right conduct of life. In my first chapter, I tried to lay before the reader a summary of the views that have been held as to right conduct. Ever since the attempt has been made to discover a rational basis of morality, human nature, regarded essentially as good, has been taken as that basis. Religions and systems of philosophy, on the other hand, which have tried to find another foundation for morality, have regarded human nature as vicious at the roots. Science has been able to tell us that man, the descendant of animals, has good and evil qualities in his nature, and that his life is made unhappy by the evil qualities. But the constitution of man is not immutable, and perhaps it may be changed for the better.

---

* "Die Welt als Wille u. Vorstellung," vol. II. p. 730.

† "Fleurs du Mal. La Mort des Pauvres," p. 340. 1883.

Morality should be based not on human nature in its existing vitiated condition, but on human nature, ideal, as it may be in the future. Before all things, it is necessary to try to amend the evolution of the human life, that is to say, to transform its disharmonies into harmonies (*Orthobiosis*). This task can be undertaken only by science, and to science the opportunity of accomplishing it must be given. However, even in the most civilised countries, science is far from being in this ideal condition. Obstacles lie in its way and retard its advance.

To make the human constitution better, it would be necessary to know it thoroughly. How can we try to transform to a normal and physiological condition old age, at present utterly pathological, unless we first understand the most intimate details of its mechanism? Deeply rooted prejudices make it very difficult to examine the organs of the aged dead. The difficulties surrounding post-mortem investigations are almost insurmountable. According to the regulations enforced in France, autopsies cannot be made until twenty-four hours after death. An autopsy cannot be made except when the corpse has not been claimed by any relatives in the direct line, husband or wife, brothers, sisters, uncles, aunts, nephews, nieces. If kinsmen put in no claim, co-operative societies may take possession of the corpse and oppose the holding of an examination. Even when an examination has been permitted, it must extend only to "the ascertaining of exact facts, and this must be taken as excluding the mutilation of the corpse by the removal of any organ or portion of the anatomy, however interesting scientifically such material might be." (Circular of the Director of "Assistance publique," January 20, 1900.*) It is easy to see that such regulations make extremely difficult the investigation of senile degeneration, and the search for means of preventing it, especially by the use of serums obtained after injecting emulsions of human organs. These difficulties in reality arise from the prejudice in favour of the existence of a life beyond the grave and a resurrection of the body.

Almost similar difficulties stand in the way of obtaining the bodies of old animals. Their owners prefer to keep animals, after they are useless, until they die, and to bury the bodies instead of devoting them to the scientific investigation that is so important to humanity.

As soon as we come to believe that the solution of the problems of human happiness will come not from religions nor from systems of metaphysical philosophy, but from exact science alone, the obstacles to progress will be removed. That scientific methods will redress the disharmonies of the human constitution is the more probable inasmuch as the old age of human beings was more physiological, and their death more natural, in earlier times than they are to-day.

The study of the human constitution not only denotes the real goal of our existence, but indicates to us what is meant by true culture and real progress.

In earlier chapters, I have shown that philosophers have recognised the existence in man of a tendency to culture and progress. But what do they mean by these two words? Attempts have been made to define them as clearly as possible, and Herbert Spencer, the greatest of living philosophers, has devoted a special essay to the subject. He examined those phenomena that he regarded as progressive, first in the inorganic world, next, in the world of living things, and, finally, in humanity. He regards as progressive only the changes that tend to increase human happiness, and it is precisely on account of that tendency that he regards them as progressive. In order to define progressive phenomena Spencer thinks it necessary to make parallel studies of them in man and the animal world. He finds that progress is marked always by a transformation from the simple and uniform to the complex; and that it produces constant differentiation, in the evolution of the planetary world, in the embryonic development of the individual, and in the societies of men and animals. But differentiation is not a complete account of progress, for in the latter must be included the change of the indefinite into the definite. Spencer identifies progress with evolution, and his well-known definition of evolution is, that it is "an integration of matter and concomitant dissipation of motion; during which the matter passes from an indefinite, incoherent homogeneity to a definite, coherent heterogeneity; and during which the retained motion undergoes a parallel transformation." Such a formula embraces too much, so that he is rather vague, especially when he applies it to human affairs. Differentiation in itself is not the whole of progress. It is necessary in each concrete case to inquire into its limits and modifications.

---

* The prohibitions in England are almost equally sweeping.—*Editor.*

The application of his theory of progress and evolution led Spencer, in his investigation of the basis of morality, to define human progress as the tendency towards a life as full and as long as possible. By fulness he means complexity, if I interpret his argument correctly. Civilised life as compared with savage life, is a realisation of progress. Civilised man, according to Spencer, uses food in a better regulated fashion, in accordance with the call and degree of his appetite ; the food is of better quality, it is freed from contamination, is much more varied and is better prepared. The same differentiation distinguishes the clothing, the homes and so forth of civilised man. According to Spencer, all such progress helps real happiness, that is to say the fulness and the prolongation of life.

It is easy to see, however, that such an interpretation of progress is inexact, like the conception of the goal of life associated with it. If the complication of the mode of life, which is so marked in modern civilisation, is really the best way of reaching happiness, there are no reasons to arrest the tendency in that direction. If, on the other hand, my view be correct, that true progress consists in the elimination of the disharmonies of human nature and in the cultivation of physiological old age followed by natural death, the conditions for realising progress would be different and very clear. The great complexity of life in modern civilisation is a sign of progress according to Spencer, but I do not agree with him. Spencer speaks of the variety and preparation of food. It is certain that this complexity militates against physiological old age, and that the simpler food of uncivilised races is better. I do not wish to write an essay on domestic hygiene, and I shall be content with saying that most of the delicate dishes provided in the homes, hotels, and restaurants of the rich, stimulate the organs of digestion and secretion in a harmful way. It would be true progress to abandon modern cuisine and to go back to the simple dishes of our ancestors. One of the conditions that enabled the Jews of the earlier Biblical times to live longer than civilised people, was, beyond all doubt, the greater simplicity of their diet. True hygiene, which is in open disagreement with the elaborated art of cookery, is also opposed to the differentiation of modern dress and dwellings. Progress thus would consist in simplifying many sides of the lives of civilised people.

The luxury which has done so much harm to mankind, and which would be included in the formula, "passage from indefinite homogeneity to definite heterogeneity," is founded not on a general law of evolution of the whole universe, but on a particular conception of life, quite different from mine according to which the rectifying of the abnormal human cycle to a normal cycle is the true goal of life.

Perhaps one of the oldest conceptions of life that has tended to luxury is to be found in the book of Ecclesiastes. Having reached the conclusion: "For in much wisdom is much grief: and he that increaseth knowledge increaseth sorrow" (i. 18), and having said: "Then I beheld all the work of God, that a man cannot find out the work that is done under the sun: because though a man labour to seek it out, yet he shall not find it, yea farther; though a wise man think to know it, yet shall he not be able to find it."* Solomon laid down the rules of life as follows: "Go thy way, eat thy bread with joy, and drink thy wine with a merry heart: for God now accepteth thy works."

"Let thy garments be always white; and let thy head lack no ointment."

"Live joyfully with the wife whom thou lovest all the days of the life of thy vanity, which he hath given thee under the sun, all the days of thy vanity; for that is thy portion in this life, and in thy labour which thou takest under the sun."

---

* Ecclesiastes, viii. 17.

"Whatsoever thy hand findest to do, do it with thy might; for there is no work, nor device, nor knowledge, nor wisdom, in the grave, whither thou goest."*

The wisdom of Solomon was to enjoy this life as much as possible, since man is unable to solve the problem of the goal of life. His precepts have been taken as a guide, and have led to an organisation of life that could only become more and more epicurean.

As soon as the goal of life has been seen clearly, luxury ceases to be true happiness as it hinders the making perfect of the normal cycle of human life. Young people, instead of abandoning themselves to all the pleasures because they have nothing before them but a sad prospect of morbid old age and death, ought to make ready for physiological old age and natural death. The apprenticeship certainly will be long. In our time the years of study already last much longer than occurred even a century ago. As the body of knowledge grows greater, the time to acquire it will become prolonged, but this period of preparation will serve as the prelude to ripe maturity and ideal old age.

Old age is repulsive at present, because it is an old age devoid of its true meaning, full of egoism, narrowness of view, incapacity and malignancy. The physiclogical old age of the future assuredly will be very different. In the societies of animals, especially as they occur among insects, the members show a high degree of differentiation. Some individuals are adapted to the reproductive functions, while others are sterile and are fitted for the care of the young and to supply the wants of the community. This differentiation, which is of social value, has arisen independently in different groups. Thus, in the societies of bees and ants the workers are sterile females, while in the case of termites, individuals of both sexes may be sterile. In the human race, evolution is following another path. There is no sign of the appearance of a sterile class; but, as the life of man is longer than that of insects, it is divided into two periods, a reproductive period and a sterile period. Old age, at present practically a useless burden on the community, will become a period of work valuable to the community. As the old man will no longer be subject to loss of memory or to intellectual weakness, he will be able to apply his great experience to the most complicated and the most delicate parts of the social life.

---

* Ecclesiastes ix. 7–10.

Young men are usually very bad politicians, and in countries where they take a large share in public affairs they do much harm because they are without the necessary practical knowledge. Their incapacity is clearly shown by the great changes in their political views as they advance in years and gain experience. In the future, old men will have charge of all complex and difficult social functions. Thus, vast improvements will be made in politics and in justice, which at present are defective because of their insufficient foundations.

As soon as every one has recognised the true goal of human life, and has assumed, as the ideal, the realisation of the normal cycle of life, a real guide to life will have been found. We shall know at least whither we are going, and as yet we are ignorant of that. We have wished to make life better, but we have not known how or for whom to make the attempt. Formerly it was assumed that, in the future, love would spread and become generalised. Family love had spread to the tribe and then had been transformed to patriotism; it was held that no obstacle stood in the way of its embracing all humanity. Such an idea was prevalent in the eighteenth century, and became a common ground of all systems of philosophy, morality and politics. But, since means of communication have been improved so vastly and since the most distant voyages are within the power of almost every one, the vague notion of "humanity" has been replaced by exact knowledge of the native savages in many parts of the earth. We have come to disbelieve in "humanity" in the old sense of the word, so great is the difference between savage and civilised peoples. And many modern theories have rejected the inclusion of the lower races in the sentiment of humanity. In the fifth chapter, I quoted the view of the moralist, Sutherland, on the advantages that have come about from the English seizure of the forests that belonged to the natives of Australia. Moreover, it is well known that a profound hatred exists between white men and black men in several parts of the earth, notably in America and the Antilles. Such instances could be multiplied.

How then are we to emerge from this difficulty? At what point is the love of the future to be stayed, if it cannot spread to all humanity?

In a recently published treatise on natural philosophy, Ostwald,* a very distinguished German physical chemist, has discussed this question. He calls good "the actions that made easier the existence of other men." But to what other men are we to apply this rule? "What is the size of the circle of altruistic love," asked Ostwald. "The general feeling," he said, "is that it should cover the family and the nation. The feeling that it should cover all humanity appears to most of us as a theoretical demand rather than something practical. And thus have not most of us the tendency to limit our altruistic actions much more in the case of men beneath us than in the case of our social comrades (Stadesgenossen)?" According to this formula, moral action would not stretch beyond our compatriots, and humanity as a whole would be excluded from it.

---

* "Vorlesungen über Naturphilosophie." Leipzig, 1902.

Here we have entered on a problem relating to the principles of normal life. In former times, religion was the chief bond among men. Later on, religion gave way to patriotism, which in default of anything better still holds its place. Community of language unites the individuals of a nation, but the advance of civilisation has undermined the foundation of that source of differentiation. Naturally, when a number of men spoke only one and the same language, great solidarity was the result, as ideas spread only by language. But such a monoglottism is not the end of human progress. As means of communication have improved, the nations have been brought in contact with each other. The knowledge of foreign languages is an elementary necessity of modern life. And so the bonds of nationality certainly will become looser, in this respect following the bonds of family. The dislike that we have to people whose language we do not understand, becomes changed into a feeling of unity with them as soon as we can understand them. In that respect an active development is in progress, and we shall have to seek out some new principle on which to base international solidarity. A good deal has been made of the possession by different nations of the same culture, but the vagueness of the phrase has not been realised. Recognition of the true goal of life and of science as the only means by which that goal may be attained would form an ideal on which men might unite; they would group themselves around that, as in former days men were held together by religion.

I think it extremely probable that the scientific study of old age and of death, two branches of science that may be called *gerontology* and *thanatology*, will bring about great modifications in the course of the last period of life. All that we know on hese subjects confirms my view. But will it lead to the development of an instinct of death? That instinct lies deep in the roots of the human constitution? Will the means be found to bring it to the surface? Has not the enormous period during which it has remained latent led to its atrophy? The science of the future alone can answer that question. But the persistence of organs and structures that are extremely ancient, as for instance, the survival of the mammary glands in males and of the vermiform appendage in anthropoid apes and man, gives us the hope that the instinct of natural death may emerge from its latent condition when old age has become a normal process.

The mammary glands of males are functionless rudiments. They must be interpreted as vestiges of organs that were more highly developed in remote ancestors among which both sexes gave milk to nourish the young. This function exists in a latent condition in the males of living mammals. Extremely rare cases have existed in which males possessed large glands secreting enough milk to feed the young. These males, it is true, had the genital organs either very badly developed or in a condition approaching hermaphroditism.* But in other authentic cases (perfectly developed) he-goats and rams have been known to provide milk in considerable quantities, whilst married men have suckled children with milk secreted by unusually developed glands. It is stated that the secretion of milk can be excited by stimulation of the nipples.† Such examples of the reappearance of a latent property that has been lost for untold ages are extremely important.

---

* Wiedersheim, "Bau des Menschen," Third Edition, pp. 21, 22. Alsberg, "Abstam. d. Mensch.," p. 61.

† Ploss-Bartels, "Das Weib," vol. II., p. 464.

Probably actual cases of the instinct of natural death in man are as rare as instances of the secretion of milk by males. But favouring circumstances and some education of the instinct of death would probably reawaken it and develop it fully. There is much work to be done before so great an object can be achieved. But it is the peculiar feature of science to be eager for much labour, while religions and systems of metaphysical philosophy are content with passive fatalism and silent resignation. The mere hope of being able to solve the great problems of humanity in the more or less distant future brings much satisfaction. When Tolstoi, agonised by the impossibility of solving the great problems, and haunted by the fear of death, asked if the love of our children is not able to sooth our souls, he found that such a hope was vain. "What is the good," he said, "of rearing children who will soon find themselves in the same difficult position as their parents?" "Why should they live? why should I love them and protect them and foster them? Is it that they may come to the same despair as I am in myself or else grow imbecile? As I love them, I do not wish to hide the truth from them, for each step in knowledge will lead them nearer to it. But the truth is—death." I can understand that many persons would abstain from having children if they had come to these pessimistic conclusions.

The point of view that I have exposed in this book will make life more possible. Our generation has no chance of attaining physiological old age and normal death; but it may take real consolation from the thought that those who are now young may advance several steps in that direction. It may reflect that each succeeding generation will get closer and closer to the solution and that true happiness one day will be reached by mankind.

The slow advance to happiness will demand many sacrifices. Already, men of science sacrifice their health and sometimes their life to reach the solution of some important problem, as for instance, to clear up a medical question, and so be ready to heal or to save the lives of their fellows.

Before it is possible to reach the goal, mankind must be persuaded that science is all-powerful and that the deeply rooted existing superstitions are pernicious. It will be necessary to reform many customs and many institutions that now seem to rest on enduring foundations. The abandonment of much that is habitual and a revolution in the mode of education will require long and painful effort.

Definition of the goal of human existence will bring great precision to the principles of morality. True policy will have to be reared on new foundations. The politics of to-day are in the condition in which medicine still remained in days long past. In the old days any one was allowed to practise medicine, because there was no medical science and nothing was exact. Even at the present time, among less civilised people, any old woman is allowed to be a midwife. In some cases the mother attends the labour of her daughter, or (as for instance in a caste of natives in Malabar), it may be the mother-in-law who does the duty. Very often friends act as midwives. Among more civilised races, differentiation has taken place, and childbirths are attended by women of special training, who are midwives by diploma. In the case of nations still more civilised, the trained midwives are directed by obstetric physicians who have specialised in the conducting of labour. This high degree of differentiation has arisen with, and has itself aided, the progress of obstetric knowledge.

Politics, as they exist to-day, correspond to the early stages of obstetric practice. Every adult male is thought fit for exercising functions so difficult as those of an elector or a juryman. The only excuse for this condition is that political science is in its infancy. When sociology is more advanced, there will come about a differentiation like that in medicine. When that has taken place, old persons who have acquired great experience, and who because of their physiological constitutions have preserved all their faculties, will give most valuable services to the society of the future.

In the progress towards the real goal of life, men will lose much of their liberty, but will receive in exchange a new feeling of solidarity. As knowledge becomes more and more extensive and exact, freedom to neglect it will be more and more limited. Formerly any one was at liberty to teach that whales were fish; but now that it has been proved that whales are mammals, the mistake is not to be pardoned. Since medicine has become more of an exact science, the liberty of doctors has been restrained. Practitioners have already been sentenced for neglecting antisepsis and asepsis. Other forms of freedom, such as the freedom to neglect vaccination against smallpox, to spit on the floor, or to let dogs run loose without being muzzled, are worthy of savage days and will cease as civilisation advances.

On the other hand, the knowledge that the goal of human life can be attained only by the development of a high degree of solidarity amongst men will restrain actual egotism. The mere fact that the enjoyment of life according to the precepts of Solomon is opposed to the goal of human life will lessen luxury and the evil that comes from luxury. Conviction that science alone is able to redress the disharmonies of the human constitution will lead directly to the improvement of education and to the solidarity of mankind.

In progress towards the goal, nature will have to be consulted continuously. Already, in the case of the ephemerids, nature has produced a complete cycle of normal life ending in natural death. In the problem of his own fate, man must not be content with the gifts of nature; he must direct them by his own efforts. Just as he has been able to modify the nature of animals and plants, man must attempt to modify his own constitution, so as to readjust its disharmonies.

Breeders form a conception of the ideal result when they are about to attempt the production of some new variety which shall be pleasing esthetically and of service to man. Next, they study the existing individual variations in animals and plants on which they wish to work, and from which they will select with the minutest care. The ideal result must have some relation to the constitution of the organisms selected.

To modify the human constitution, it will be necessary first, to frame the ideal, and thereafter to set to work with all the resources of science.

If there can be formed an ideal able to unite men in a kind of religion of the future, this ideal must be founded on scientific principles. And if it be true, as has been asserted so often, that man can live by faith alone, the faith must be in the power of science.

34-42

INDEX

ABORTION, artificial, 102, 103, 104, 105
  as a religious ceremony, 164
Abstinence, Hartmann on sexual, 186
Aged, fear of death by, 131
  murder of, by low races, 129, 130
  treatment of, by modern society, 130
Albius, and artificial fertilisation, 20
Alcohol, and length of life, 259
  as producer of sclerosis, 247
Altruism, limitations of, 296
Anæsthetics, influence of, compared with death, 159
Ancestor-worship, in China, 144
  by Confucius, 145, 146
  by Kaffirs, 150
  quotations from Tylor on, 150
Animism, Tylor on, 138, 139, 140
Anisoplia and light, 36
Annelids, vegetative reproduction of, 264
Annihilation, Büchner on, 220
  Mailaender on, 188
Anthropoid apes, relationship to man, 55
  social instincts of, 105
Ants, sexual disharmonies in, 34
Apes, compared with man, 42, 43
Appendage, vermiform, of man and apes, 44
Appendicitis, 66, 67
  curable by modern science, 211
  frequency of, 68
Apoplexy, phagocytes in, 239
Aristotle, on future life, 169
  on pleasure, 6
Art, as affected by Christianity, 13
  of the Greeks, 5
Arterial sclerosis. 247
Arteries, in old age, 237
Asceticism, 11
Atrophy, in old age, 238
Aurelius, Marcus, on death, 172, 174, 262
  on immortality, 172
  Renan on, 174

BACON, on failure of philosophy, 203
  on lengthening life, 257
Bacteria of the intestines, 248, 249
Baobab-tree, age of, 266
Baudelaire, on death, 288
Baumann, on microbes in intestines, 251
Beetles, as food of wasp larvæ, 28, 29
Behring, von, on diphtheria, 211
Benares, Buddha's sermon at, 154
Bert, Paul, on treatment of the aged, 130
Bible, old age in, 280
Bienstock, on harmful microbes, 256
  on intestinal putrefaction, 255
Birds, absence of large intestine in, 252
  age of, 232
Bischoff, on reproductive organs of apes, 81
Blindness, of infants, how prevented, 211
Blood, experiments on serum of, 52, 53
Blood corpuscles, specific sensibility of, 160
Boas, on cancer, 215
Bones, in old age, 237, 243
Bordet, on cytotoxic serums, 245
Botulism ("sausage-disease"), microbe of, 257
Brain, invasion of macrophags (figure), 241
Brunetière, on failure of science, 218
Buddha, contempt of women, 9
  death of, 158
  on disease, 154
  on fear of death, 153
  on immortality, 147

Buddha, on Nirvâna, 158
  on old age, 154
  on renunciation, 154
  sermon at Benares, 154
  on sorrows of existence, 205
Buddhism, and celibacy, 163
  and fear of death, 119
  and future life, 144
  and immortality, 147, 148
  and pessimism, 176, 177
Büchner, on Buddhism, 144
  on morality, 107
  on science, 219
Burial, of the old, alive, 152
Bütschli, on immortality of protozoa, 264
Byron, on fear of death, 177
  on instinctive nature of fear of death, 128
  on pessimism, 177

CÆCUM, absence of, in birds, 253
  of chimpanzee (figure), 45
  and disease, 69
  of man (figure), 44
  of man and apes, compared, 44
  of monkeys, 67
Çakya-Mouni, discovers death and disease, 119, 120
Calkins, on degeneration of infusoria, 232
Cancer, in alimentary canal, 73, 74
  modern science and, 213, 214
Casimir, sacrifices at burial of, 141
Castration, Hartmann on, 183
Catasetum, disharmony in, 30
Catasetum saccatum (figure), 24
Caterpillars and cocoons, 33
Celibacy, 12, 13, 163
Cellulose, digestion of, 252
Centenarians, Lankester on, 259
  Lejoncourt on, 280
Cerceris, figure of, 28
Chætogaster, vegetative reproduction of (figure), 265
Chemotaxis, of sexual cells, 268
Childbirth, ages of women at, 93
  pains of, 92
Chinese, ancestor-worship among, 144
  belief in immortality, 145
  Buddhists, views on future life, 149
  laws against, 109
Christianity, and asceticism, 11
  and continence, 163
  influence of, on art, 13
  and human nature, 7, 10
Chromophags, in blanching of hairs, 243
Cicero, on death, 169, 263
  on future life, 169
Civilisation, and progress, 292
Cocoons, formation of, 33
Confucius, on ancestor-worship, 145, 146
Conjugation, and immortality, 264
Connective tissue, in old age, 236, 238
Consciousness, relation of to bodily functions, 160
Credé, on prevention of infantile blindness, 210
Cruger, on bees and orchids, 23
Cuisine, modern, evils of, 292
Cytotoxic serums, 245

DAHLMANN, on meaning of Nirvâna, 156
Darwin, on fertilisation of orchids, 21, 22
  on luminous insects, 37
  on natural morality, 8
  on origin of man, 40
Davids, Rhys, on meaning of Nirvâna, 156, 157
Death, Aurelius on, 262
  Baudelaire on, 288
  Cicero on, 169, 263
  Guyau on, 195
  Hartmann on, 184
  Mailaender on, 188, 189, 190
  Nordau on, 193
  Plato on, 166, 167
  Renan on, 195
  Rückert on, 195
  Schiller on, 195
  Schopenhauer on, 179, 180, 181, 288
  Seneca on, 171
  Socrates on, 166, 167
  Tokarsky on, 125
  Tolstoi on, 122, 123, 299
  Weismann on, 266
  Zola on, 226
  Philosophers on, 133
  as annihilation, 162
  compared with anæsthetics, 159
  fear of, 115, 116, 153
  feigning of, 114
  in ephemerids, 275
  instinct of, 281, 298
  of Jewish patriarchs, 280, 281
  natural, 266, 272, 277, 278, 279, 280, 299
  in old age, 267
  scientific study of, 262
Degeneration, senile, in infusoria, 231
  in insects, 232
  in vertebrates, 232

De Goncourt, quotations from, 121, 225
Deniker, a fœtus of man and ape, 47
Descartes, on lengthening life, 257
Desire of life, not to be ignored, 228
De Vries, on new species, 57
Diet, as regulated by religious, 162
Digestive system of man, 60
Disease, religious measures against, 164
Dogs, old age in, 233
D'Holbach, on natural morality, 7
Dragon-tree, of Oratava, 265
Dubois, on *Pithecanthropus*, 50
Du Bois Reymond, on agnosticism, 221
Dufour, on wasps. 27
Duhring, a blind optimist, 117
Duncan, Matthews, on childbirth, 94
Duration of life, 277, 278

EBSTEIN, on prolonging life, 258, 260
Ecclesiastes, on life, 293
Edgren, on arterial sclerosis, 247
Elixirs of life, 257
Emasculation, by Skoptsy, **9**
Ephemerids (figures), 271, **273**
    absence of instinct of preservation in, 275
    larvæ (figure), 272
    sexual instincts of, 36
    swarming of, 271
Epicureans, *summum bonum* of, 6
Ewald, on microbes in intestines, 251, 252
Eye, of man, imperfections of, 78

FABRE, on caterpillars, 33
    on fossorial wasps, 27, 28, **34**
Faith, modern return to, 222
    Tolstoi's return to, 224
    Zola's attraction to, 225
Family instincts, 108
    love, 295
Fauvel, on natural death, 280
Fear, of death, Rousseau on, 118
    Tokarsky on, 125
    Tolstoi on, 122, 123
    in the aged, 118, 131
    in Buddhism, 119
    by a Christian minister, 124
    by French writers, 121, 122, 132
    instinctive nature of, 127, **128**, 153
    occasional absence of, 152
Feet, of man and apes, 43
Fichte, on future life, 176
Finot, on continuity of life, 197
    on fear of death, 122, 126, 197
Flies, cause of death of, 274
Flora of the intestines, 248, 249, **251**
Flourens, on limits of life, 277
Fœtus of gibbon, figure of, 46
    of man, figure of, 47
Food, of ancestral man, 74
    instinct of choice of, 75, **76**
Fossorial wasps, 27, 34
Future life, Cicero on, 169
    Fichte on, 176
    Kant on, 176
    Plato on, 168
    belief in, 141, 149, 151, 159
    opposed by reason, 161, 165, *see* Immortality

GENERAL paralysis, symptoms of, 111
Gerontology, science of old age, 297
Glow-worms, 37
Goal of human life, 300, 301
Gods, of the Greeks, 4
    of the Orientals, 4
Goncourt, E. de, quotations on fear of death, 121, 132
Gorillas, old age in, 233
Greek art, 5
    philosophy, 5
Gruenbaum, on injection of serums, 54
Guinea-pigs, reared without microbes, 249
Guyau, on death, 195, 196; on love, 196
    on religion and death, 133
    on failure of science, 222
    on resignation, 199

HAECKEL, on the "cellular soul," 269
    on future life, 221
    on morality, 107
Hair, blanching of, 242 (figure), 243
    and disease, 63
    of embryo, 63
Hammerling, on optimism, 191, 192
"*Hamlet*," quotation from, 227
Hands, of man and apes, 43
Happiness, Hartmann on, 186
    Mailaender on, 189
    Meyer-Benfey on, 198
    meaning of, 111
Hartmann, on death, 184
    on immortality, 184
    pessimism of, 183
    on progress, 185
    as a youthful pessimist, 117
Hassenstein, on childbirths in the young, 283

Heape, on menstruation, 88
Hegel, death from cholera, 120
Heim, on feelings at death, 126
Hell of Chinese Buddhists, 149
Helmholz, on the eye, 78
Henseler, on ages of patriarchs, 259
Hermaphroditism, 79, 80
Herminium monorchis, figure of, 26
Huber, on ants, 34
Hufeland, on prolonging life, 258
Humanity, vagueness of conception, 296
Humboldt, on natural morality, 8
Hunt, on burial of the aged living, 152
Hutcheson, on naturalism, 7
Huxley, on origin of man, 41
Hymen, disharmonies of, 85
    distinctive of human race, 81, 82
    primitive function of, 85, 86
    ritual destruction of, 83, 84

ILLUSION, Hartmann on, 183
    Mailaender on, 188
Immortality, Aristotle on, 169
    Buddha on, 147
    Hartmann on, 184
    Meyer-Benfey on, 198
    Plato on, 168
    Schopenhauer on, 179, 180, 181
    Seneca on, 170
    Spinoza on, 175
    amongst animals, 270
    of "cellular soul," 269
    of protozoa, 264
    of reproductive cells, 267
Inaudi, the calculator, 58
Infanticide, 103, 104
Infusoria, conjugation of, 231
    immortality of, 263, 264
    reproduction of, 230
    senile degeneration of, 231
Insects, compared with vertebrates, 276
    fertilisation of plants by, 21
    senile degeneration of, 231
Instinct of death, 281, 282, 283, 298
    of family, 108
    of life, 129
    sexual, 283
    of society, 109
Intestines, bacterial flora of, 248, 249
    large, degeneration of, 70
    arge, diseases of, 73, 74
    arge, excision of, 70
    large, function of, 70, 71, 72

JEWISH belief in future life, 142
Justice, in relation to humanity, 112

KANT, on future life, 176
Kephir, use of, 255
Khémâ, legend on immortality, 147
Kidney ducts, 80
Koch, on microbe of tuberculosis, 212

LACTIC acid, arrests putrefaction, 255
Lady-birds and nectar, 32
Language, as a social band, 297
Lankester, Ray, on centenarians, 259
Lanugo, of human embryo, 62
Larvæ, of ephemerids, 276
Lecky, on natural morality, 8
Lejoncourt, on centenarians, 280
Leucocytes and phagocytes, 240
Liberty, future limitation of, 301
Life, duration of, in Biblical times, 259, 260
    modes of lengthening, 257, 258
Light, attractive to insects, 35
Linnæus, on origin of man, 41
Lister, and antisepsis, 209
Listera ovata, figure of, 32
Loeb, on natural death, 266
Longet, on old age, 234
Longevity, in birds, 232
    and large intestine, 252
    in Old Testament, 259, 260
Love, Guyau on, 196
    spreading of, 295
Lubbock, on ancestor-worship, 150
    an optimist, 117
Luminous insects, 37
Luther, Martin, on supernatural origin of disease, 164
Luxury, evils of, 293, 294, 301

MACROPHAGS, definition of, 240
    functions of, 240
    in senile decay, 241
Maeterlinck, on pessimism, 191
Mailaender, on pessimism, 187, 188
Malignant tumours, science and, 214
Mammary glands, rudimentary, 298
Man, destiny of, 286
    disharmonies, and harmonies in, 285
    origin of, 40, 286
    peculiar characters of, 59
    rudimentary organs of, 59, 60
Marinesco, on function of phagocytes, 241
Marriage, age at first, 97
    Christian views on, 163
    early, in primitive races, 86, 90
Martelly, on intestinal putrefaction, 255
Materialism, Büchner on, 220
    Haeckel on, 220

Matriopathy, 6
May-flies and light, 35
Medicine, advance of, 210
Memory, late development of, 78
Ménière, on bees and orchids, 21
Menstruation, in monkeys, 88, 89
    origin and significance, 87, 88
    origin of, 89
    regarded as impure, 92
Merkel, on tissue-changes in old age, 238
Metamorphoses, of ephemerides, 272
Metchnikoff, on blanching of hair, 242
    on senile atrophy, 238
Metchnikoff, Madame, on tadpoles reared without microbes, 249
Meyer-Benfey, on happiness, 198
    on immortality, 198
Microbes, absence of, in ephemerids, 274
    harmful, 256
    of the intestines, 248
    producing poisons in intestines, 251
Microphags, definition of, 240
    functions of, 240
Milk, fermented or soured, beneficent action of, 255
    human, 282
    secretion of, by males, 298
Monkeys, and choice of food, 75
Morality, based on human nature, 9
    true foundation of, 289
Mosaic regulations on diet, 162, 163
Moths and light, 35
Müller, Johannes, on the eye, 78
    Hermann, on lady-birds, 32
    Max, on meaning of Nirvâna, 155, 158
Mutilations of the body, 9, 15

Naegeli, on natural death, 265
Natural death, 302
    cases of, 278, 279, 280
    in ephemerids, 27
Nature, Marcus Aurelius on life according to, 173
    and morality, early opinions on, 3
Negroes and whites, 109
Nicene Creed, compared with ancestor-worship, 151
Nirvâna, Aurelius and, 175
    Hartmann on, 186
    Schopenhauer on, 182
    meaning of, 155, 156, 157
Nordau, on old age, 234
    on optimism, 192; on pain, 193
Nuttall and Thierfelder, on germ-free guinea-pigs, 249

Obstetrics, in ancient times, 300
Old age, Longet on, 234
    Nordau on, 234
    amelioration of, 254
    in birds and mammals, 232, 233
    characters of, 229, 230, 278, 294
    morbidity of, 244
    scientific study of, 228
    serums in, 245, 246
Onanism, 35, 95, 96, 99
Optimism, Hammerling on, 191, 192
    Nordau on, 192
Optimists generally old men, 117
Origin of man, due to sudden appearance of new characters, 57, 59
Orangs, old age in, 233
Orchids, and fertilisation, 19, 20
Orthobiosis, the taste of science, 289
Ostwald, on love of humanity, 296
Ova, immortality of, 267

Pain, Nordau on, 193
Palingenia, swarming of, 272
Pantheism, of German poets, 195
Paradise, according to the Talmud, 143
    of Chinese Buddhists, 149
Paramecium, conjugation of (figure), 231
    division of (figure), 230
Parasites, late evolution of, 18
Parovaria, 80
Parrots, paucity of bacterial flora in, 253
Pasteur, as founder of modern scientific medicine, 209
Pasénadi, legend on immortality, 147
Pathology, of old age, 278
Patriotism, 295
Pelopæus, figure of, 34
Penis, os, in man and apes, 81
Personality, consciousness of, 160
Pessimism, Byron on, 177
    Hartmann on, 183
    Maeterlinck on, 191
    Mailaender on, 187
    Schopenhauer on, 177, 178, 179
    and Buddhism, 176, 177
    and disease, 206
    and disharmony, 38
    origin of, 176
    value of, 194
    and youth, 117
Pettenkofer, suicide of, 131
Pfeffer, on chemotaxis in cryptogams, 269
Pflüger, on prolonging life, 258
Pfungst, on meaning of Nirvâna, 156

Phagocytes, functions of, 239
  inhibited by lactic acid, 255
  and poisons, 247
  sensibility of, 240
Phagocytosis, in old age, 244
  in senility, 242
Philosophy, and death. 166
  relation of, and religion, 166
  tendency of, to become religious, 175
Phenol, production of by microbes, 251
Pithecanthropus, 50
Placenta, of man and apes, 46
Plague, cause of, 208
Plato, and nobility of man, 4
  on pleasure, 6
  views on death, 166, 167, 168
Pleasure, views of Plato and Aristotle on, 6
Plotin, on immortality, 175
Pollinia of orchids, 21
Politicians, incapacity of young, 295
Politics, compared with savage obstetrics, 300
Post-mortem examinations, 246, 289
Pregnancy, avoidance of, 101
Progress, Hartmann on, 185
  Spencer on, 291
  not uniform, 18
Protection, means for, amongst animals, 114
Protozoa, absence of death, 263
  sensibility of, 268
Purgatory, in Taoism, 146
Putrefaction, in large intestine, 73, 254

RABBITS, and destruction of young, 34, 37
Reformation, 14
Regeneration, in brain, 277
  in cells, 271
  in vertebrates, 270
Religion, and diet, 163
  and disease, 205
  and future life, 150
  and science, 3
  and sexuality, 163
  Tolstoi's return to, 223
Renal tubule, invasion of macrophags (figure), 241
Renan, on death, 195
  on Jewish belief in future life, 142, 143
  on Marcus Aurelius, 174
Renaissance, art of, 14
Reproduction, not cause of death in ephemerids, 275
Reproductive organs, 79
Resignation, in Buddhism, 159
  Guyau on, 199
  Hartmann's system of, 187
  Marcus Aurelius on, 174
Resurrection, primitive belief in, 140
Réville, on Chinese belief in immortality, 145, 146
Rhizotrogus and light, 36
Richet, on failure of science, 222
Rousseau, on age and love of life, 117
  on failure of science, 216
  on fear of death, 118
Rovighi, on utility of milk diet, 255
Rückert, on death, 195
Rudimentary organs, in man, 59, 60

SACRIFICE, at burials, 140, 141
Saint-Foix, on sacrifice of horses, 141
St. Matthew, on celibacy, 12
Savage, on old age in apes, 233
  on social instincts of apes, 105
Schiller, on death, 195
Schopenhauer, and cholera, 120
  on death, 121, 179, 288
  on immortality, 179
  pessimism of, 117, 177, 178, 179, 207
Schottelius, on rearing of germ-free chicks, 249
Science, advance of, 286
  Bacon on, 204
  destroys faith, 226
  failure of, 215, 216, 217, 218, 222, 223
  and immortality, 287
  and old age, 228
  and pessimism, 207, 286
Sclerosis of arteries, 248
  in old age, 236, 237, 243, 244
  due to poisons, 247
Scotch clergy on man, 12
Seidlitz, on natural morality, 8
Selenka, on fœtus of man and ape, 47
Self-preservation, 113, 275
Seneca, on death, 171
  on human existence, 171
  on immortality, 170
  on nature as a guide, 7, 10
Senile decay action of macrophags, 241
  characters of, 235, 238, 239
  importance of phagocytes in, 241
Sensibility, specific, of white blood corpuscles, 160
Serum, alteration of properties, 51
  anti-diphtheritic, 211
  properties of, as guide to affinity, 51

Serums, use of in old age, 245, 246
Sexuality, early appearance of, 94, 95
  in the aged, 98
  disharmonies of, 100
Sexual cells, immortality of, 268
  soul of, 268
Shakespeare, sorrow and knowledge, 227
Shaving, regarded as degrading, 5
Skeleton, of man and apes, 43
Skin, of man, 62
Skoptsy, and emasculation, 9
Social instincts, 105, 109, 113
Societies, of insects, 294
Socrates, and death, 166, 167
Solidarity, of men, 297
Solomon, sorrow and knowledge, 226
Soul of cells, Haeckel on, 269
  of protozoa, 268
  of sexual cells, 268
Soured milk, benefits of, 255
Spencer, H., on belief in resurrection, 140
  on natural morality, 9
  on progress, 291
Spermatozoa, immortality of, 267
  in old men, 97
Spinoza, on immortality, 175
Sterility, in human life, 295
  in social insects, 294
Stoics, *summum bonum* of, 6
  on future life, 169
Strassburger, on microbes of the intestines, 248
Suicide, increase of, 4, [illegible]
  of the old, 131
  Schopenhauer, Hartmann, and Mailaender on, 190
Supernaturalism, modern craving for, 222
Survival after death, widespread belief in, 149
Sutherland, on morality of expropriation, 109, 296
Syphilis, absence of reference to in Bible, 260
  resistance to effects of, 256
  and sclerosis, 247

Tadpoles, reared without microbes, 249
Taine, on Christian art, 14
Tait, Lawson, on cysts, 80
Talmud, on paradise, 143
Taoism and immortality, 146
Teeth, disharmonies of, 63, 64
  of man and apes, 41
  wisdom, 64
Telepathy, no argument for future life, 161
Tetanus, microbes of, 256
Thanatology, science of death, 297
Thierfelder, and Nuttall, on germ-free guinea-pigs, 249
Tissier, on intestinal putrefaction, 255
Tokarsky, on fear of death, 125, 279
Tolstoi, on fear of death, 115, 122, 299
  on failure of science, 217, 223
  return to religion, 223, 224
Tombs, burial of weapons and implements, 139
Transfusion of blood-serum, 51
Transmigration of souls, in Buddhism, 157
  of souls, Jewish belief in, 144
Trees, death of, 265
Tuberculosis, modern science and, 212
Tylor, on ancestor-worship, 150
  on animism, 138

Uhlenhuth, on injection of serums, 53

Vanilla, cultivation of, 19
  fertilisation of, 20
Vaccination, 301
Vermiform appendage and disease, 66, 68
  of man and apes, 44
Virginity, historical importance of, 83, 84

Waitz-Gerland, on primitive customs, 139
Weapons, burial with dead, 139
Weismann, on origin of death, 266
  on immortality of protozoa, 264
Wiedersheim, on human characters, 59
Will to live, Mailaender on, 189
  Schopenhauer on, 182
Wisdom teeth, degeneration of, 64, 65
Women, views of Buddha on, 9
Wounds, modern success in healing of, 210

Xenocrates, 5

Youth, absence of fear of death, 116, 117
  and excesses, 116
  ideals of, 263
  and pessimism, 117

Zola, on death, 225
  on fear of death, 121
Zulu, ancestor-worship, 151

Putnam's Science Series

1.—**The Study of Man.** By Professor A. C. HADDON, M.A., D.Sc. M.R.I.A. Fully illustrated. 8°, net $2.00.

"A timely and useful volume. . . . The author wields a pleasing pen and knows how to make the subject attractive. . . . The work is calculated to spread among its readers an attraction to the science of anthropology. The author's observations are exceedingly genuine and his descriptions are vivid."—*London Athenæum.*

2.—**The Groundwork of Science.** A Study of Epistemology. By ST. GEORGE MIVART, F.R.S. 8°, net $2.00.

"The book is cleverly written and is one of the best works of its kind ever put before the public. It will be interesting to all readers, and especially to those interested in the study of science."—*New Haven Leader.*

3.—**Rivers of North America.** A Reading Lesson for Students of Geography and Geology. By ISRAEL C. RUSSELL, Professor of Geology, University of Michigan, author of "Lakes of North America," "Glaciers of North America," "Volcanoes of North America," etc. Fully illustrated. 8°, net $2.00.

"There has not been in the last few years until the present book any authoritative, broad résumé on the subject, modified and deepened as it has been by modern research and reflection, which is couched in language suitable for the multitude. . . . The text is as entertaining as it is instructive."—*Boston Transcript.*

4.—**Earth Sculpture; or, The Origin of Land-Forms.** By JAMES GEIKIE, LL.D., D.C.L., F.R.S., etc., Murchison Professor of Geology and Mineralogy in the University of Edinburgh; author of "The Great Ice Age," etc. Fully illustrated. 8°, net $2.00.

"This volume is the best popular and yet scientific treatment we know of of the origin and development of land-forms, and we immediately adopted it as the best available text-book for a college course in physiography. . . . The book is full of life and vigor, and shows the sympathetic touch of a man deeply in love with nature."—*Science.*

5.—**Volcanoes: Their Structure and Significance.** By T. G. BONNEY, F.R.S., University College, London. Fully illustrated. 8°. Revised and Enlarged Edition. Illustrated. Net $2.00.

"It is not only a fine piece of work from a scientific point of view, but it is uncommonly attractive to the general reader, and is likely to have a larger sale than most books of its class."—*Springfield Republican.*

6. **Bacteria:** Especially as they are related to the economy of nature, to industrial processes, and to the public health. By GEORGE NEWMAN, M.D., F.R.S. (Edin.), D.P.H. (Camb.), etc., Demonstrator of Bacteriology in King's College, London. With 24 micro-photographs of actual organisms and over 70 other illustrations. 8°, net $2.00.

"Dr. Newman's discussions of bacteria and disease, of immunity, of antitoxins, and of methods of disinfection, are illuminating, and are to be commended to all seeking information on these points. Any discussion of bacteria will seem technical to the uninitiated, but all such will find in this book popular treatment and scientific accuracy happily combined."—*The Dial.*

7.—A Book of Whales. By F. E. BEDDARD, M.A., F.R.S. Illustrated. 8°. Net, $2.00.

"Mr. Beddard has done well to devote a whole volume to whales. They are worthy of the biographer who has now well grouped and described these creatures. The general reader will not find the volume too technical, nor has the author failed in his attempt to produce a book that shall be acceptable to the zoölogist and the naturalist."—*N. Y. Times.*

8.—Comparative Physiology of the Brain and Comparative Psychology. With special reference to the Invertebrates. By JACQUES LOEB, M.D., Professor of Physiology in the University of Chicago. Illustrated. 8°. Net, $2.00.

"No student of this most interesting phase of the problems of life can afford to remain in ignorance of the wide range of facts and the suggestive series of interpretations which Professor Loeb has brought together in this volume."—JOSEPH JASTROW, in the *Chicago Dial.*

9.—The Stars. By Professor SIMON NEWCOMB, U.S.N., Nautical Almanac Office, and Johns Hopkins University. 8°. Illustrated. Net. $2.00.

"The work is a thoroughly scientific treatise on stars. The name of the author is sufficient guarantee of scholarly and accurate work."—*Scientific American.*

10.—The Basis of Social Relations. A Study in Ethnic Psychology. By DANIEL G. BRINTON, A.M., M.D., LL.D., Sc.D., Late Professor of American Archæology and Linguistics in the University of Pennsylvania; Author of "History of Primitive Religions," "Races and Peoples," "The American Race," etc. Edited by LIVINGSTON FARRAND, Columbia University. 8°. Net, $2.00.

"Professor Brinton his shown in this volume an intimate and appreciative knowledge of all the important anthropological theories. No one seems to have been better acquainted with the very great body of facts represented by these sciences."—*Am. Journal of Sociology.*

11.—Experiments on Animals. By STEPHEN PAGET. With an Introduction by Lord Lister. Illustrated. 8°. Net, $2.00.

"To a large class of readers this presentation will be attractive, since it gives to them in a nut-shell the meat of a hundred scientific dissertations in current periodical literature The volume has the authoritative sanction of Lord Lister."—*Boston Transcript.*

12.—Infection and Immunity. With Special Reference to the Prevention of Infectious Diseases. By GEORGE M. STERNBERG, M.D., LL.D. Surgeon-General U. S. Army (Retired). Illustrated. 8°. Net, $2.00.

"A distinct public service by an eminent authority. This admirable little work should be a part of the prescribed reading of the head of every institution in which children or youths are gathered. Conspicuously useful."—*N. Y. Times.*

13.—Fatigue. By A. MOSSO, Professor of Physiology in the University of Turin. Translated by MARGARET DRUMMOND, M.A., and W. B. DRUMMOND, M.B., C.M., F.R.C.P.E.; extra Physician, Royal Hospital for Sick Children, Edinburgh; Author of "The Child, His Nature and Nurture." Illustrated. 8°. Net, $1.50.

"A book for the student and for the instructor, full of interest, also for the intelligent general reader. The subject constitutes one of the most fascinating chapters in the history of medical science and of philosophical research."—*Yorkshire Post.*

14.—Earthquakes. In the Light of the New Seismology. By CLARENCE E. DUTTON, Major, U. S. A. Illustrated. 8°. Net, $2.00.

"The book summarizes the results of the men who have accomplished the great things in their pursuit of seismological knowledge. It is abundantly illustrated and it fills a place unique in the literature of modern science."—*Chicago Tribune.*

15.—The Nature of Man. Studies in Optimistic Philosophy. By ÉLIE METCHNIKOFF, Professor at the Pasteur Institute. Translation and introduction by P. CHAMBERS MITCHELL, M.A., D.Sc. Oxon. Illustrated. 8°. Net, $1.50.

"A book to be set side by side with Huxley's Essays, whose spirit it carries a step further on the long road towards its goal."—*Mail and Express.*

16.—The Hygiene of Nerves and Mind in Health and Disease. By AUGUST FOREL, M.D., formerly Professor of Psychiatry in the University of Zurich. Authorized Translation. 8°. Net, $2.00.

A comprehensive and concise summary of the results of science in its chosen field. Its authorship is a guarantee that the statements made are authoritative as far as the statement of an individual can be so regarded.

17.—The Prolongation of Life. Optimistic Essays. By ÉLIE METCHNIKOFF, Sub-Director of the Pasteur Institute. Author of "The Nature of Man," etc. 8°. Illustrated. Net, $2.50. Popular Edition. With an introduction by Prof. CHARLES S. MINOT. Net, $1.75.

In his new work Professor Metchnikoff expounds at greater length, in the light of additional knowledge gained in the last few years, his main thesis that human life is not only unnaturally short but unnaturally burdened with physical and mental disabilities. He analyzes the causes of these disharmonies and explains his reasons for hoping that they may be counteracted by a rational hygiene.

18.—The Solar System. A Study of Recent Observations. By Prof. CHARLES LANE POOR, Professor of Astronomy in Columbia University. 8°. Illustrated. Net, $2.00.

The subject is presented in untechnical language and without the use of mathematics. Professor Poor shows by what steps the precise knowledge of to-day has been reached and explains the marvellous results of modern methods and modern observations.

19.—Heredity. By J. ARTHUR THOMSON, M.A., Professor of Natural History in the University of Aberdeen; Author of "The Science of Life," etc. 8°. Illustrated. Net, $3.50.

The aim of this work is to expound, in a simple manner, the facts of heredity and inheritance as at present known, the general conclusions which have been securely established, and the more important theories which have been formulated.

20.—Climate—Considered Especially in Relation to Man. By ROBERT DECOURCY WARD, Assistant Professor of Climatology in Harvard University. 8°. Illustrated. Net, $2.00.

This volume is intended for persons who have not had special training in the technicalities of climatology. Climate covers a wholly different field from that included in the meteorological text-books. It handles broad questions of climate in a way which has not been attempted in a single volume The needs of the teacher and student have been kept constantly in mind.

21.—Age, Growth, and Death. By CHARLES S. MINOT, James Stillman Professor of Comparative Anatomy in Harvard University, President of the Boston Society of Natural History, and Author of "Human Embryology," "A Laboratory Text-book of Embryology," etc. 8°, Illustrated. $2.50 net.

This volume deals with some of the fundamental problems of biology, and presents a series of views (the results of nearly thirty years of study), which the author has correlated for the first time in systematic form.

22.—**The Interpretation of Nature.** By C. LLOYD MORGAN, LL.D., F.R.S. Crown 8vo. Net, $1.25.

Dr. Morgan seeks to prove that a belief in purpose as the causal reality of which nature is an expression is not inconsistent with a full and whole-hearted acceptance of the explanations of naturalism.

23.—**Mosquito Life.** The Habits and Life Cycles of the Known Mosquitoes of the United States; Methods for their Control; and Keys for Easy Identification of the Species in their Various Stages. An account based on the investigation of the late James William Dupree, Surgeon-General of Louisiana, and upon the original observations by the Writer. By EVELYN GROESBEECK MITCHELL, A.B., M.S. With 64 Illustrations. 8°. Net, $2.00.

This volume has been designed to meet the demand of the constantly increasing number of students for a work presenting in compact form the essential facts so far made known by scientific investigation in regard to the different phases of this, as is now conceded, important and highly interesting subject. While aiming to keep within reasonable bounds, that it may be used for work in the field and in the laboratory, no portion of the work has been slighted, or fundamental information omitted, in the endeavor to carry this plan into effect.

24.—**Thinking, Feeling, Doing.** An Introduction to Mental Science. By E. W. SCRIPTURE, Ph.D., M.D., Assistant Neurologist Columbia University, formerly Director of the Psychological Laboratory at Yale University. 189 Illustrations. 2d Edition, Revised and Enlarged. 8°. Net, $1.75.

"The chapters on Time and Action, Reaction Time, Thinking Time, Rhythmic Action, and Power and Will are most interesting. This book should be carefully read by every one who desires to be familiar with the advances made in the study of the mind, which advances, in the last twenty-five years, have been quite as striking and epoch-making as the strides made in the more material lines of knowledge."—*Jour. Amer. Med. Ass'n.*, Feb. 22, 1908.

25.—**The World's Gold.** By L. DE LAUNAY, Professor at the École Supérieure des Mines. Translated by Orlando Cyprian Williams. With an Introduction by Charles A. Conant, author of "History of Modern Banks of Issue," etc. 8°. Net, $2.00.

M. de Launay is a professor of considerable repute not only in France, but among scientists throughout the world. In this work he traces the various uses and phases of gold; first its geology; secondly, its extraction; thirdly, its economic value.

26.—**The Interpretation of Radium.** By FREDERICK SODDY, Lecturer in Physical Chemistry in the University of Glasgow. Third Edition, rewritten, with data brought down to 1912. 8°. With 33 Diagrams and Illustrations. $2.00 net.

As the application of the present-day interpretation of Radium (that it is an element undergoing spontaneous disintegration) is not confined to the physical sciences, but has a wide and general bearing upon our whole outlook on Nature, Mr. Soddy has presented the subject in non-technical language, so that the ideas involved are within reach of the lay reader. No effort has been spared to get to the root of the matter and to secure accuracy, so that the book should prove serviceable to other fields of science and investigation, as well as to the general public.

27.—**The Social Evil.** With Special Reference to Conditions Existing in the City of New York. A Report Prepared in 1902 under the Direction of the Committee of Fifteen. Second Edition, Revised, with New Material Covering the Years 1902–1911. Edited by EDWIN R. A. SELIGMAN, LL.D., McVickar Professor of Political Economy in Columbia University. 8vo. $1.75 net.

A study that is far from being of merely local interest and application. The problem is considered in all its aspects and, for this purpose, reference has been made to conditions prevailing in other communities and to the different attempts foreign cities have made to regulate vice.

28.—**Microbes and Toxins.** By ETIENNE BURNET, of the Pasteur Institute, Paris. With an Introduction by Elie Metchnikoff, Sub-Director of the Pasteur Institute, Paris. With about 71 Illustrations. $2.00 net.

A well-known English authority said in recommending the volume: "Incomparably the best book there is on this tremendously important subject. In fact, I am assured that nothing exists which gives anything like so full a study of microbiology." In the volume are considered the general functions of microbes, the microbes of the human system, the form and structure of microbes, the physiology of microbes, the pathogenic protozoa, toxins, tuberculin and mallein, immunity, applications of bacteriology, vaccines and serums, chemical remedies, etc.

19

PLEASE DO NOT REMOVE
CARDS OR SLIPS FROM THIS POCKET

UNIVERSITY OF TORONTO LIBRARY

Biol. Metchnikoff, Elie
M The nature of man.

BioMed.
180244